Reclamation Board Meeting
October 20, 2006

Staff Report
Permit No. 17979-BD
Three Rivers Levee Improvement Authority
Bear River, Yuba County

Action

Consider if the US Fish and Wildlife Service agreements provide for flood conveyance maintenance without mitigation requirement of Special Condition FOURTEEN in Permit No. 17979-BD (Attachment A) that would allow elderberry shrubs to be planted at the project site.

Background

Three Rivers Levee Improvement Authority (TRLIA) Permit No 17979-BD to degrade the existing Bear River federal project levee and to remove 250 acres of walnut orchard and restore 526 acres within the Bear River floodway was approved by the Board at the December 19, 2005 Board meeting. Special Condition FOURTEEN of this permits states:

> *No elderberry shrubs shall be planted at the project site until an agreement has been obtained from the US Fish and Wildlife Service and approved by The Reclamation Board that allows for maintenance for flood conveyance purposes to occur within the channel without requiring mitigation.*

As part of the permit issued to TRLIA under Clean Water Act Section 404 by the Corps of Engineers (Corps) for flood control improvements to the Feather River, Bear River, and Western Pacific Interceptor Canal (WPIC), the US Fish & Wildlife Service (USFWS) provided two biological opinions and two amendments that addressed impacts to the Valley Elderberry Longhorn Beetle (VELB), a listed threatened species under the federal Endangered Species Act (Act). As required by Special Condition FOURTEEN, the Board must approve the agreement before elderberry shrubs are planted within the Bear River floodway. The permittee is proposing to plant 1,661 elderberry shrubs to mitigate for VELB impacts caused by project activities plus an additional 15,000 elderberry shrubs to be planted as part of the overall riparian restoration. A total of about 130,000 seedlings of various species will be planted within the Bear River Floodway for the mitigation and restoration activities.

Biological Opinions

The USFWS issued biological opinions for Stage 1 activities in August 2005 (Attachment B) and Stage 2 activities in January 2006 (Attachment C) associated with proposed project improvements. The USFWS also issued two subsequent amendments, the first in June 2006 (Attachment D) that modified the Stage 1 opinion and the second in October 2006 (Attachment E) that modified both the Stage 1 and 2 opinions.

The Board's concern regarding the ability to perform maintenance for flood conveyance purposes without having to mitigate for VELB habitat impacts to as expressed by Special Condition FOURTEEN is addressed in the October 2006 amendment, which identifies conservation measures to be implemented when performing maintenance activities in the mitigation/restoration area and provides by for incidental take within the project area. Under the terms of section 7(b)(4) and section (o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided such taking is in compliance with the Incidental Take Statement. The October 2006 amendment modifies the incidental take provision of the Stage 1 opinion by changing the last sentence on page 41 to read:

> *Therefore, the Service estimates that all vernal pool fairy shrimp and vernal poll tadpole habitat shrimp inhabiting 9.14 acres of vernal pool habitat and all beetles inhabiting elderberry bushes within the 639 acre project will be taken as a result of the proposed project"*

The Stage 2 opinion was modified by changing the last paragraph on page 4 to read:

> *The Service anticipates that all valley elderberry longhorn beetles inhabiting elderberry bushes within the 639 acre project will be taken as a result of the proposed project.*

VELB conservation measures to be implemented when performing maintenance activities within the project area identified in the October 2006 amendment are:

1. If flood conveyance improvements are required within the Preserve, areas temporarily disturbed during these activities that do not require continued management would be restored with the original vegetation species mix.
2. A qualified biologist familiar with elderberry shrubs shall be retained for consultation prior to initiation of flood conveyance improvements activities and shall have the authority to choose access routs. Access routs, staging areas, and all project activities should be chosen in a manner that will cause the least amount of damage to beetle habitat. Removal of elderberry shrubs should be limited to the minimum necessary to achieve food conveyance requirements

3. Prior to any extraordinary maintenance activities to improve flood conveyance within the Preserve, crews shall be trained by a qualified biologist to identify and minimize harm to beetle habitat and other biologically sensitive areas.

Issues

Although significant progress has been made by the Corps, TRLIA and USFWS in developing an agreement to meet the flood maintenance without mitigation concerns of the Board, there are several issues that staff believes should be resolved prior to Board approval of the agreements.

1. The biological opinions appear to apply only to TRLIA through the issuance of the 404 Permit to that entity. It is unclear if the incidental take approval can be applied to successors of TRLIA or to parties, such as the Department of Water Resources (DWR), that are not named in the agreement. Therefore, the agreement should be modified so that it is clear that any party with future maintenance responsibilities is covered by the incidental take agreement. It is especially important that DWR be covered for incidental take as DWR is ultimately responsibility for channel maintenance as proved for in the California Water Code.
2. Flood control flowage easements for the levee and area waterward of the levee should be acquired prior to the issuance of any conservation easements. Conservation easements and deed restrictions are required as a condition of the 404 Permit (Attachment G) and may be required as conditions of the $20 million in Proposition 13 restoration funding provided by the Wildlife Conservation Board and Department of Fish and Game. Special Condition TWENTY-ONE of Permit No. 17979-BD states:

   Prior to construction, the permittee or successor shall secure form the owner of the property a permanent easement granting the Sacramento-San Joaquin Drainage District, acting by and through The Reclamation Board of the State of California, the flood control rights stated in the attached form of deed over that portion of the existing or to be constructed levee (including the area parallel and extending 50 feet from the waterward toe and landward toes of the levee) which is not presently encumbered by a Reclamation Board levee easement. Contact Jeffery Fong at (916) 657-2831.

   At this time, the permittee has not complied with Special Condition TWENTY-ONE. Although it is not unusual on a large project for flood control easements to be transferred later than required by a permit, for this permit, it is imperative that flood control easements be acquired prior to issuance of any conservation easements to ensure maintenance activities required for flow conveyance can be performed as necessary in the future. Having incidental take approval is meaningless if there are conservation

easements in place that prohibit or unreasonably limit future maintenance activities.

3. A sensitivity analysis of the Manning's "n" roughness value used for hydraulic modeling of the restoration area was requested but has not yet been received. It is important that changes in roughness value have little or no effect upon the conveyance capacity of the floodway. If the results of the hydraulic model are sensitive to roughness, that is, show large changes in conveyance for small changes in roughness, the reliability of the modeling will be more dependent upon the selection of the correct roughness value for use in the hydraulic model.
4. There has been some concern about propagation of elderberry shrubs downstream of mitigation or restoration area. In this case, the take agreement obtained as part of the O'Connor Lake permit (No. 17936) covers the area downstream of the proposed project site on the Feather River to the confluence with the Sutter Bypass. Therefore, VELB take authority already exists downstream of the project site.
5. The Section 404 Permit has conditions that restrict or prohibit certain normal maintenance activities within the project area. Form a discuss with Corps regulatory staff, the operation and maintenance manual being prepared by the permittee for the mitigation/restoration area can include a description of the use of normal maintenance activities. Therefore, a thorough review of the operation and maintenance manual for the mitigation/restoration area and revisions to the Sacramento River Flood Control Project should both be review by staff from DWR's Flood Maintenance Office staff and the Reclamation Board to ensure the ability to perform normal maintenance activities has been addressed.
6. DWR has reviewed the biological opinions and provided comments similar those discussed above in a memorandum to the Board dated October 12, 2006 (Attachment G).

Staff Recommendation

Although staff believes all agencies involved are working in good faith to ensure the integrity of flood system while improving the benefits of a viable ecosystem, the issues discussed above should be resolved prior to Board approval of the USFWS agreements. Therefore, the staff recommendation is for the Board not to approve the USFWS agreements in their current form.

The Board may also want to consider approval of the agreements subject to additional special conditions and delegate authority to staff to approve the permit upon staff concurrence of permittee compliance with the special conditions. Additional special conditions to Permit No. 17979-BD have been prepared and are presented for Board consideration (Attachment H).

Attachments

A. Permit No. 17979-BD
B. Stage 1 Biological Opinion, 1-1-05-F-0106, August 10, 2005
C. Stage 2 Biological Opinion, 1-1-06-F-0026, January 9, 2006
D. Amendment to Stage 1 BO, 1-1-06-F-0101, June 16, 2006
E. Amendment to Stage 1 and Stage 2 BOs, 1-1-06-F-0255, October 1, 2006
F. Corps of Engineers, Section 404 Permit, July 17, 2006
G. Maintenance Comments, DWR Memorandum, October 12, 2006
H. Draft motion for approval of USFWS agreements

Attachment A

Reclamation Board
Permit No. 17979-BD

STATE OF CALIFORNIA
THE RESOURCES AGENCY
THE RECLAMATION BOARD

This Permit is issued to:

PERMIT NO. 17979 GM

Three Rivers Levee Improvement Authority
915 Eighth Street, Suite 115
Marysville, California 95901

To remove approximately 10,000 cubic yards of material along 5,300 linear feet of the right (west) bank levee of the Bear River, and along approximately 3,700 linear feet of the left (east) bank of the Feather River; remove approximately 250 acres of orchard; plant approximately 526 acres with: Fremont cottonwood, mixed willow, Valley oak, shrub clusters, blue elderberry shrubs, grassland savanna and shaded riverine aquatic; and maintain upper 100 acres as open (non-vegetative) overflow area. The project is located south of Marysville, west of Highway 70 and south of Feather River Boulevard (Section 17,19,20,29&30, T13N, R4E, MDB&M, Reclamation District 784, Bear River, Yuba County).

NOTE: Special Conditions have been incorporated herein which may place limitations on and/or require modification of your proposed project described above.

(SEAL)

Dated: FEB 10 2006

Dan S. Fua
General Manager

GENERAL CONDITIONS:

ONE: This permit is issued under the provisions of Sections 8700 – 8723 of the Water Code.

TWO: Only work described in the subject application is authorized hereby.

THREE: This permit does not grant a right to use or construct works on land owned by the Sacramento and San Joaquin Drainage District or on any other land.

FOUR: The approved work shall be accomplished under the direction and supervision of the State Department of Water Resources, and the

permittee shall conform to all requirements of the Department and The Reclamation Board.

FIVE: Unless the work herein contemplated shall have been commenced within one year after issuance of this permit, the Board reserves the right to change any conditions in this permit as may be consistent with current flood control standards and policies of The Reclamation Board.

SIX: This permit shall remain in effect until revoked. In the event any conditions in this permit are not complied with, it may be revoked on 15 days' notice.

SEVEN: It is understood and agreed to by the permittee that the start of any work under this permit shall constitute an acceptance of the conditions in this permit and an agreement to perform work in accordance therewith.

EIGHT: This permit does not establish any precedent with respect to any other application received by The Reclamation Board.

NINE: The permittee shall, when required by law, secure the written order or consent from all other public agencies having jurisdiction.

TEN: The permittee is responsible for all personal liability and property damage which may arise out of failure on the permittee's part to perform the obligations under this permit. If any claim of liability is made against the State of California, or any departments thereof, the United States of America, a local district or other maintaining agencies and the officers, agents or employees thereof, the permittee shall defend and shall hold each of them harmless from each claim.

ELEVEN: The permittee shall exercise reasonable care to operate and maintain any work authorized herein to preclude injury to or damage to any works necessary to any plan of flood control adopted by the Board or the Legislature, or interfere with the successful execution, functioning or operation of any plan of flood control adopted by the Board or the Legislature.

TWELVE: Should any of the work not conform to the conditions of this permit, the permittee, upon order of The Reclamation Board, shall in the manner prescribed by the Board be responsible for the cost and expense to remove, alter, relocate, or reconstruct all or any part of the work herein approved.

SPECIAL CONDITIONS FOR PERMIT NO. 17979 GM

THIRTEEN: Prior to performing any work approved by this permit, the Three Rivers Levee Improvement Authority (permittee) or successor shall obtain written approval to proceed with the project from the Corps of Engineers. If the Corps of Engineers' approval modifies the project as approved by The Reclamation Board, the permittee or successor shall be required to submit a request to The Reclamation Board to amend this permit to address modifications required by the Corps of Engineers.

FOURTEEN: No elderberry shrubs shall be planted at the project site until an agreement has been obtained from the US Fish and Wildlife Service and approved by The Reclamation Board that allows for maintenance for flood conveyance purposes to occur within the channel without requiring mitigation.

FIFTEEN: After receiving written approval from the Corps of Engineers but prior to beginning degradation of the right (north) bank of the Bear River federal project levee, the permittee or successor shall submit a proposed plan of construction for completion of the setback levee for approval by The Reclamation Board. The plan of construction shall have a schedule with clearly defined interim construction stages and completion dates and a flood emergency contingency plan to be implemented by the permittee or successor if a flood or high water event occurs prior to completion of construction of the setback levee.

SIXTEEN: No work authorized by this permit shall be performed until the Three Rivers Levee Improvement Authority and its' member agencies (County of Yuba and Reclamation District No. 784)

agree jointly and severally to defend, indemnify and hold harmless the State of California, including its' agencies, departments, boards, and commissions, and their respective officers, agents, employees, sucessors, and assigns, safe and harmless of and from all claims and damages arising out of the work authorized by this permit, and to discharge this obligation to the extent allowed by law.

SEVENTEEN: Upon completion of construction, the permittee or successor shall request the Corps of Engineers perform an initial eligibility inspection of the setback levee for acceptance into the nonfederal PL 84-99 Program. Copies of both the request for and result of the initial eligibility inspection shall be provided to the Board.

EIGHTEEN: Prior to start of construction the permittee or successor shall contact the Corps of Engineers and initiate the decertification process for that portion of the Federal Flood Control Project levees that are to be abandoned.

NINETEEN: When work is proposed on land owned in fee by The Reclamation Board, the permittee or successor shall secure an easement, license, or temporary entry permit from The Reclamation Board prior to commencement of work. Contact Jeffery Fong at (916) 657-2831.

TWENTY: For work proposed on land owned in fee or easement by Reclamation District No. 784, the permittee or successor may be required to secure an easement, license, or permit from the District prior to commencement of work.

TWENTY-ONE: Prior to construction, the permittee or successor shall secure from the owner of the property a permanent easement granting the Sacramento and San Joaquin Drainage District, acting by and through The Reclamation Board of the State of California, the flood control rights stated in the attached form of deed over that portion of the existing or to-be-constructed levee (including the areas parallel to and extending 50 feet from the waterward and landward toes of the levee) which is not presently encumbered by a Reclamation Board levee easement. Contact Jeffery Fong at (916) 657-2831.

TWENTY-TWO: All work approved by this permit shall be in accordance with the submitted drawings and specifications except as modified by special permit conditions herein. No further work, other than that approved by this permit, shall be done in the area without prior approval of The Reclamation Board.

TWENTY-THREE: Upon completion of the project, the permittee or successor shall submit as-built drawings to: Department of Water Resources, Flood Project Inspection Section, 3310 El Camino Avenue, Suite LL30, Sacramento, California 95821.

TWENTY-FOUR: The permittee or successor shall maintain the permitted encroachment(s) and the project works within the utilized area in the manner required and as requested by the authorized representative of the Department of Water Resources, Reclamation District No. 784 or any other agency responsible for maintenance.

TWENTY-FIVE: The permittee or successor shall contact the Department of Water Resources by telephone, (916) 574-1213, and submit the enclosed postcard to schedule a preconstruction conference. Failure to do so at least 10 working days prior to start of work may result in delay of the

project.

TWENTY-SIX: The permittee or successor shall provide supervision and inspection services acceptable to The Reclamation Board. A professional engineer registered in the State of California shall certify that all work was inspected and performed in accordance with submitted drawings, specifications, and permit conditions.

TWENTY-SEVEN: The Reclamation Board and Department of Water Resources shall not be held liable for damages to the permitted encroachment(s) resulting from releases of water from resevoirs, flood fight, operation, maintenance, inspection, or emergency repair.

TWENTY-EIGHT: The permittee or successor may be required, at permittee's or successor's cost and expense, to remove, alter, relocate, or reconstruct all or any part of the permitted encroachment(s) if removal, alteration, relocation, or reconstruction is necessary as part of or in conjunction with any present or future flood control plan or project or if damaged by any cause. If the permittee or successor does not comply, The Reclamation Board may remove the encroachment(s) at the permittee's or successor's expense.

TWENTY-NINE: The permittee or successor shall be responsible for repair of any damages to the project levee and other flood control facilities due to construction, operation, or maintenance of the proposed project.

THIRTY: The permittee or successor is responsible for all liability associated with construction, operation, and maintenance of the permitted facilities and shall defend and hold harmless the State of California, or any departments thereof, from any liability or claims of liability associated therewith.

THIRTY-ONE: If the project, or any portion thereof, is to be abandoned in the future, the permittee or successor shall abandon the project under direction of The Reclamation Board and Department of Water Resources, at the permittee's or successor's cost and expense.

THIRTY-TWO: No construction work of any kind shall be done during the flood season from November 1 to April 15 without prior approval of The Reclamation Board.

THIRTY-THREE: Cleared trees and brush shall be completely burned or removed from the floodway, and downed trees or brush shall not remain in the floodway during the flood season from November 1 to April 15.

THIRTY-FOUR: No material stockpiles, temporary buildings, or equipment shall remain in the floodway during the flood season from November 1 to April 15.

THIRTY-FIVE: The permitted encroachment(s) shall not interfere with operation and maintenance of the flood control project. If the permitted encroachment(s) are determined by any agency responsible for operation or maintenance of the flood control project to interfere, the permittee or successor shall be required, at permittee's or successor's cost and expense, to modify or remove the permitted encroachment(s) under direction of The Reclamation Board or Department of Water Resources. If the permittee or successor does not comply, The Reclamation Board may modify or remove the encroachment(s) at the permittee's or successor's expense.

THIRTY-SIX: During degradation portion of the project, any and all anticipated or unanticipated conditions encountered which may impact levee integrity or flood control shall be brought to the attention of the Flood Project Inspector immediately and prior to continuation. Any encountered abandoned encroachments within the limits of this project shall be completely removed or abandoned under the direction of the Flood Projects Integrity and Inspection Branch Inspector.

THIRTY-SEVEN: Any haul ramps and utilized levee crown roadway shall be maintained in a manner prescribed by the authorized representative of the Department of Water Resources or any other agency responsible for maintenance.

THIRTY-EIGHT: A profile of the levee crown roadway and access ramps that will be utilized for access to and from the borrow areas shall be submitted to The Reclamation Board prior to commencement of excavation.

THIRTY-NINE: Any damage to the levee crown roadway or access ramps shall be promptly repaired to the condition that existed prior to this project, or better.

FORTY: No material shall be stockpiled closer than 50 feet from either toe of the project levee.

FORTY-ONE: Any damage caused to the levee during placement or removal of the stockpiled material shall be repaired.

FORTY-TWO: All fencing and gates removed during construction of this project shall be replaced in kind and at the original locations. If it is necessary to relocate any fence or gate, the permittee or successor is required to obtain written approval from The Reclamation Board prior to installation at a new location.

FORTY-THREE: All temporary fencing and gates shall be removed upon completion of project.

FORTY-FOUR: The permittee or successor shall replant or reseed the levee slopes to restore sod, grass, or other non-woody ground covers if damaged during project work.

FORTY-FIVE: Trees removed from the floodway shall have their root systems removed and disposed of outside the floodway. All voids created by tree removal shall be backfilled and compacted to at least the density of the adjacent, firm, undisturbed soil.

FORTY-SIX: If agricultural use of the new/existing floodway is being considered the permittee or successor shall design and construct appropriate ramps and access roads for this use.

FORTY-SEVEN: All debris generated by this project shall be disposed of outside the existing and proposed floodways and off all levee sections..

FORTY-EIGHT: In the event that levee or bank erosion injurious to the adopted plan of flood control occurs at or adjacent to the permitted encroachment(s), the permittee or successor shall repair the eroded area and propose measures, to be approved by The Reclamation Board, to prevent further erosion.

FORTY-NINE: If the permitted encroachments, including abandoned project levee sections, result(s)

in an adverse hydraulic impact, the permittee or successor shall provide appropriate mitigation measures, to be approved by The Reclamation Board, prior to implementation of mitigation measures.

FIFTY: Any vegetative material, living or dead, that interferes with the successful execution, functioning, maintenance, or operation of the adopted plan of flood control must be removed by the permittee or successor at permittee's or successor's expense upon request by The Reclamation Board, Department of Water Resources, or local maintaining agency. If the permittee or success does not remove such vegetation or trees upon request, The Reclamation Board reserves the right to remove such at the permittee's or successor's expense.

FIFTY-ONE: The permittee shall comply with all conditions set forth in the letter from the Department of the Army dated February 9, 2006, which is attached to this permit as Exhibit A and is incorporated by reference.

EXHIBIT A

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

February 9, 2006

Navigation and Flood Control Unit (17979)

General Manager
The Reclamation Board
State of California
3310 El Camino Ave., Room LL40
Sacramento, CA 95821

Dear General Manager:

We have reviewed an application for a permit by Three Rivers Improvement Authority (Reclamation Board Number 17979). These plans include removing approximately 10,000 cubic-yards of material along 5,300 linear-feet of the right bank levee of the Bear River and along approximately 3,700 linear-feet of the Feather River's left bank and Bear River's confluence (for construction of setback levee under Reclamation Board Number 17782), removing approximately 250-acres of orchard, planting approximately 526-acres with fremont cottonwood, mixed willow, valley oak, shrub clusters, blue elderberry shrubs, grassland savana and shaded riverine aquatic habitat, maintaining the upper 100-acres as open flow (non-vegetative) overflow areas of both the Bear River and Feather River, and reassigning the setback levee as the new Federal Project levee. The project is located south of Marysville, west of Highway 70, and south of Feather River Boulevard in Sections 17, 19, 20, 29, and 30 Township 13 North, Range 4 East, M.D.B. & M. Survey, Olivehurst, California.

The District Engineer has no objection to approval of this application by your Board from a flood control standpoint subject to the following conditions:

a. That if a borrow pit is created, it must be located at least 200-feet from the levee toes of both the Feather River and the Bear River, unless the excavation operation takes place in the flood season, November 1 to April 15, in which case the borrow pit must be located at least 400-feet from the levee toes. In the event construction extends into the flood season, the applicant shall backfill the borrow pit with suitable material and compacted to at least the density of the surrounding land, to at least 400-feet from the levee toes.

b. That the existing Federal Project Levee shall not be degraded until 408 approval is granted by the Secretary of the Army and the setback levee is adopted as a project levee by the Corps of Engineers.

c. That The Reclamation Board accept the transfer of the new levee into their flood control system and accept all operations, maintenance, and flood risk liabilities associated with the levee.

d. That the applicant shall develop an amendment, approved by the Corps of Engineers, to the existing Operation and Maintenance manual, before the levee is accepted into the Federal Flood Control Project.

e. That the proposed plantings shall conform to 1) the California Code of Regulations Title 23 Section 131 Vegetation and to 2) the Guide for Vegetation on Project Levees adopted by your Board on 5 September 1969.

A Section 10 and/or Section 404 permit application (200400685) is in process for this work.

If you have any questions concerning our comments on this permit application, please contact Mr. Mohsen Tavana at (916) 557-5282 or Mr. Robert Murakami at (916) 557-6738.

Sincerely,

Michael D. Mahoney, P.E.
Chief, Construction-Operations Division

CF:
DWR, Pal Sandhu

Attachment B

US Fish and Wildlife Service
Biological Opinion
1-1-05-F-0106
Stage 1 Work Activities
August 10, 2005

200400685

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In reply refer to:
1-1-05-F-0106

10 August 2005

Mr. Tom Cavanaugh
Sacramento Valley Office Chief
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, California 95814-2922

Subject: Formal Consultation on the Proposed Feather River, Bear River, and Western Pacific Interceptor Canal Levee Improvements Project (Corps file number 200400685), Yuba County, California

Dear Mr. Cavanaugh:

This letter is in response to the U.S. Army Corps of Engineers (Corps) request for formal consultation with the U.S. Fish and Wildlife Service (Service) on the proposed Feather River, Bear River, and Western Pacific Interceptor Canal (WPIC) Levee Improvements Project (proposed project) in Yuba County, California. Your March 28, 2005, request was received in our office on March 30, 2005. This document represents the Service's biological opinion on the effects of the action on the federally threatened vernal pool fairy shrimp (*Branchinecta lynchi*), the endangered vernal pool tadpole shrimp (*Lepidurus packardi*) (vernal pool crustaceans), the threatened valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) (beetle), and the threatened giant garter snake (*Thamnophis gigas*) (snake). This document is issued in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act).

The findings and recommendations in this biological opinion are based on: (1) the March 28, 2005, letter from the Corps initiating consultation for the proposed project; (2) the March 2005, *Revised Biological Assessment for the Feather-Bear-WPIC Levee Project* prepared by Jones and Stokes Associates; (3) the June 2005, *Final Biological Assessment for the Feather-Bear-WPIC Levee Project*; and (4) other information available to the Service.

BIOLOGICAL OPINION
Consultation History

October 7, 2004. The Corps requested initiation of formal consultation on the proposed project.

December 16, 2004. The Service issued a letter requesting additional information on the proposed project (Service file number 1-1-05-I-0056).

March 30, 2005. The Service received the March 28, 2005, revised request for initiation of formal consultation with the Corps and a copy of the updated biological assessment from Jones and Stokes Associates.

May 10, 2005. The Service attended a meeting held by Jones and Stokes Associates regarding environmental effects attributable to the project. The Service provided comments on the draft biological assessment and asked for a revision of the document.

June 22, 2005. The Service received the June 2005, *Final Biological Assessment for the Feather-Bear-WPIC Levee Project* from Jones and Stokes Associates.

June 28, 2005. In a telephone conversation between Jennifer Hobbs of the Service and Harry Oakes of Jones and Stokes Associates, the Service requested acreages for all upland habitats within 200 feet of giant garter snake aquatic habitat.

July 13, 2005. The Service received figures and acreages for upland impacts to giant garter snake habitat.

July 20, 2005. Jennifer Hobbs of the Service and Harry Oakes and Chris Eliot of Jones and Stokes Associates met to discuss the effects to upland habitat for the giant garter snake

July 25, 2005. The Service received final acreage numbers for effects of the project to giant garter snake upland habitat.

Proposed Project Description

The proposed project is located in the southern portion of Yuba County. This project is part of an overall plan to enhance flood protection to properties in the Three Rivers Levee Improvement Authority's (TRLIA) service area. These levee improvements are intended to reduce potential threats to three factors of levee integrity: stability, height, and susceptibility to erosion.

The project is divided into several components. A description of each component follows below.

Fill WPIC Borrow Ditch

A borrow ditch exists along the west side of the WPIC levee. It was likely created during the construction of the railroad berm. Although it is not openly connected to another waterway or

channel, it supports wetland vegetation and associated wildlife. The presence of the borrow ditch compromises the stability of the WPIC levee because hydrostatic pressure from the adjacent canal cannot be fully contained by the available soil material. The borrow ditch would be filled to an elevation equal to the surrounding ground surface. Ground-disturbing activities associated with placing fill in the borrow ditch would occur between station 0+00 (the confluence of the WPIC and the Bear River) and station 130+00.

Filling of the borrow ditch would occur primarily during the dry season (i.e., from June to October, subject to extension) and would include the removal of vegetation using a bulldozer, the tilling of the area to loosen the dirt, and the filling of the trench with borrow material. Approximately 78,000 cubic yards of borrow material would be used to fill the trench to the adjacent ground level. Fill would be imported from a permitted source, which may include the Olivehurst detention basin, a concurrently planned project by Yuba County. Up to 7,800 truck trips, occurring over a period of 116 days would be necessary to import all the material. Two bulldozers would place the materials, and two sheepsfoot compactors would compact the soils into place.

After the fill material has been placed, all disturbed areas will be seeded with a mixture of native and naturalized grass and forb species. Implementation of these improvements is planned to begin in 2005 and culminate in 2006.

Orchard Removal

Removal of a privately owned walnut orchard from the Bear River floodway is expected to take place over a period of 3 months. Approximately 252 acres would be removed and replaced with a native land cover type. The primary native land cover type would consist of grasslands. A portion of this area would also be used to compensate for effects on valley oak and riparian habitats, and other cover types.

Construct Setback Levee

Construction of the setback levee would include clearing and grubbing, construction of a slurry wall, excavation of an inspection trench, preparatory levee foundation work, and the removal or relocation of structures and utilities. The western terminus of the setback levee would tie into the Feather River levee near station 45+00, just south of Pump Station #2. The setback levee would extend northeastward from the Feather River levee for approximately 2 miles to its eastern terminus near station 130+00 on the Bear River levee. Land within the footprint of the setback levee would total approximately 45 acres. The lands between the setback levee and the existing Feather and Bear River levees would range from 0.10 – 0.80 mile and total approximately 300 acres.

Prior to construction of the levee a slurry wall would be constructed below grade. The top of the slurry wall would be equal to the existing soil surface grade. The setback levee would then be constructed on top of the slurry wall alignment. The construction of a slurry cutoff wall along the setback levee alignment would reduce seepage beneath the levee by creating a low-

permeability barrier and dispersing hydrostatic pressure. The maximum depth of the slurry wall is expected to be approximately 80 feet. Slurry wall construction would include trench excavation, backfill preparation, and the placement of fill material.

The soil fill required to construct the setback levee would be obtained from one or more of the following sources: stockpiled material excavated during the implementation of other project elements (e.g., detention basins), an offsite commercial source, and from borrow areas located on the agricultural lands between the setback levee and the existing Feather and Bear River levees. Approximately 1.0 million cubic yards of borrow material would be required to construct the setback levee. The existing Feather and Bear River levees would be left in place. No soil would be removed from these levees to construct the setback levee.

The existing agricultural lands in the levee setback area would be permanently impacted by levee construction. All or portions of this approximately 300 acre area would be excavated to gather borrow material. Following completion of the setback levee, this area would be set aside as a habitat mitigation area. A final mitigation design has not been prepared for this area, but it is expected that target habitats would include wetland, riparian, oak woodland and grassland. Passive and/or active mitigation strategies may be implemented. A detailed mitigation strategy will be developed at a later time.

Construction of the setback levee would include the use of heavy equipment, including scrapers and bull dozers. Approximately 5,800 truck trips will be required to haul in quarry material (e.g., drain rock, aggregate roadway materials) and other materials. An additional 400 truck trips would be needed to remove waste materials. Approximately 50,000 truck trips would be necessary to deliver all the soil material for the setback levee. Most of these trips would occur within the levee setback area if the primary borrow source is located onsite. It is anticipated that the setback levee would be constructed in 150 working days.

Staging areas for the setback levee would be located within the construction corridor along the setback levee alignment. It is anticipated that the staging areas would be located on agricultural lands and that no additional impacts to native land cover types would occur.

Construct Detention Basin

A detention basin would be constructed to compensate for the lost detention storage in the setback levee area. The detention basin would be constructed as a means to offset the need for increased pumping associated with the loss of water storage area. The detention basin would be located on the east side of Clark Slough and north of the setback levee. The 23-acre detention basin would have a capacity of 230 acre-feet and would be excavated to a depth of 10 feet.

Construction of the detention basin would include the use of heavy equipment, including scrapers and bulldozers. Approximately 37,000 cubic yards of material would be excavated and stockpiled for use in the setback levee construction or the construction of other project elements.

Reconstruct Bear River Levee

As a result of both stability and height issues, the Bear River levee requires a levee raise and the construction of an impervious soil layer on the waterside of the levee from station 131+00 to station 140+00 to stabilize the levee. The area would occur between the eastern terminus of the proposed setback levee and the Algodon Canal. This location is the approximate area of the breach that occurred during the 1997 floods. The levee would be dismantled and reconstructed to a height approximately 0.3 foot higher than the existing levee crown.

Construction would begin by removing approximately the top 3 feet of existing soil and excavating a 5 foot deep toe trench on the waterside levee slope. The soil removal would be performed using two bulldozers and an excavator. Approximately 8,400 cubic yards of levee material would be excavated and spoiled on site or used as fill for other project improvements (e.g., WPIC borrow ditch fill).

It is estimated that up to 8,400 cubic yards of material would need to be imported to the project area. Approximately 840 truck trips would be required to import the necessary materials and an equal number of trips would be needed to transport spoils to onsite spoils locations. The levee improvements would be implemented using an excavator, two bulldozers and two compactors. It is anticipated that reconstruction would last up to 30 days.

Relocate Pump Station #6

Pump Station #6 is located just west of SR 70 and north of the Bear River levee. The pump station is located at the southern terminus of the Algodon Canal. The pump station has decreased the levee stability because of its proximity to the levee. Relocating the pump station would involve dismantling the existing pump station and constructing a replacement facility approximately 150 feet north of the existing location. The portion of the Algodon Canal between the new and old pump station locations would be backfilled to increase levee stability.

The existing pump station would be removed using a crane, and waste materials would be disposed of off-site by truck. Approximately four truck trips would be necessary to remove the waste to a permitted disposal or recycling facility. An additional four truck trips would be required to import the new pump station materials. A crane would place the new pump, and hand crews would secure it. The pump relocation/replacement would last approximately 7 days. The area between the new and old pump stations would be filled with approximately 5,300 cubic yards of borrow material. This material could be imported form Reclamation District (RD) 1001, or the remainder of soil excavated during the Bear River levee reconstruction could be used. If the material was imported, it would require 270 truck trips. The material would be placed and compacted by simultaneously using a bulldozer and a compactor. It is anticipated that relocation of the pump station, and the associated backfill, would last up to 30 days.

Raise Bear River Levee

Portions of the Bear River levee between stations 151+00 and 169+00 need to be raised or widened to meet freeboard standards. This levee section would be raised an average of 1.5 feet by adding soil materials to the landside and crown of the levee. To raise the levee, four haul trucks would import 8,500 cubic yards of soil from RD 1001 and would place the material adjacent to the existing levee. Approximately 20 truck trips a day would be necessary to deliver the material. Two bulldozers would position the material, and two compactors compact it into place. In addition, a 10-foot easement would be purchased to allow access for levee maintenance. It is anticipated that raising the levee would last up to 30 days.

Construct WPIC Slurry Cutoff Wall

The construction of a slurry cutoff wall on a portion of the WPIC levee would reduce seepage in the levee by creating a low-permeability barrier and dispersing hydrostatic pressure. A 50-foot-deep slurry cutoff wall would be constructed between stations 251+00 and 270+50.

The construction of a slurry cutoff wall would use conventional slot trench methods: a trench would be excavated through the levee and subsurface materials and would then be backfilled with low-permeability materials. During construction, the trench, which would be 2-3 feet wide and extend to depths of up to 50 feet, would be kept open using a bentonite-water slurry. The soil excavated from the trench would be hauled to a mixing location near station 220+00, where it would be mixed with hydrated bentonite and cement to reduce permeability and increase strength. The soil-cement-bentonite mixture would then be hauled to the levee and backfilled into the trench. This mixture would create a low-permeability barrier in the levee.

During slurry cutoff wall construction, one crew would be able to construct up to 100 linear feet of slurry wall (for depths of to 50 feet) in an 8-hour shift. Equipment needed would include a long-stick excavator (80-foot reach), three or four dump trucks (10-cubic yard capacity each), and tow loaders at the mixing location. Approximately 7,000 dump truck trips would be necessary to haul material between the excavator and the mixing area along the levee. The mixing area would be used to prepare the soil-bentonite mixture and supply the bentonite-water slurry. All of this equipment would operate simultaneously for 8-12 weeks.

Vertical clearance of about 40 feet would be needed for the excavator boom. Horizontal clearance of about 10 feet beyond the levee crest may be required for excavator swing when loading dump trucks.

Materials imported to the site would include bentonite, cement, water (if a domestic supply is not available nearby), and construction support materials.

Although the exact locations of the mixing areas have not been identified at this time, all soil mixing will occur within the areas of temporary or permanent impact identified in this assessment. Excess soils remaining after construction of the slurry wall will be used to construct other project elements (e.g., setback levee).

The only permanent facility associated with the construction of the slurry cutoff wall would be the wall itself, which may be 2-3 feet wide, up to 36 feet deep, and up to 1,700 feet long. The entire wall would be within the levee. The mixing area would be restored to preproject conditions after the slurry cutoff wall was constructed.

Raise WPIC Levee Crown-Unchanged Footprint

To increase freeboard, the WPIC levee crown would be raised between stations 296+00 and 332+50. This reach would be raised an average of 0.5 foot.

Approximately 7,000 cubic yards of soil would be imported using haul trucks. The material would come from RD 1001. A total of 700 truck trips would be required; approximately 16 truck trips would be required each day, using tow trucks, over a period of 45 days. Two bulldozers and tow compactors (one each at each site) would be needed to place, position, and compact material on the levee crown. Disturbance may occur up to 100 feet from the levee in these locations. However, the area would be returned to preproject conditions after construction was completed.

Raise WPIC Levee-Widened Footprint (Waterside of Levee)

Portions along the WPIC between stations 0+00 and 137+50 and stations 210+00 and 25+00 would be raised to accommodate freeboard standards. The crown would be raised an average of 1.2 feet by adding soil to the levee crown as well as the waterside slope of the levee, which would increase the levee footprint.

Raising the levee by extending the footprint into the water would include the construction of a ramp on the landside of the levee to allow access to the levee. The ramp would be 12 feet wide and 60 feet long, made of imported material, and constructed using a bulldozer in a location where it would have the least effect on existing resources. Staging of equipment would be primarily on the levee crown, but some equipment would be kept adjacent to the landside of the levee. Approximately 80,000 cubic yards of material would be imported using haul trucks. Bulldozers would place and position the material on the waterside of the levee and crown, and compactors would compact the material. The levee footprint would be extended by 6 feet. Four bulldozers and four compactors would complete the full levee raise in 30 days. The area disturbed for the construction of the ramp and staging areas would be returned to preproject conditions after construction was completed.

Implement Erosion Control Measures

Portions of the Bear River levee slopes are proposed to be protected with riprap to minimize erosion along the waterside banks. Approximately 4,000 cubic yards of riprap would be placed on the Bear River levee between approximately stations 145+50 and 150+50 and between stations164+00 and 169+00.

The riprap would be 2-3 feet in diameter and would be placed on the waterside of the levee to protect against erosional forces, such as wind-generated waves and high water velocities. The

riprap would come from a permitted quarry within 25 miles of the project area. Areas disturbed by the equipment or riprap stockpiling would be returned to preproject conditions after construction was completed.

Temporary Staging, Storage, and Work Areas

The specific locations of the temporary staging, storage, soil-mixing and other work areas have not been identified at this time. Although these locations have not been identified, all activities associated with these areas will occur within areas of temporary or permanent impact identified in this assessment.

Proposed Conservation Measures

All Listed Species

1. A Service approved biologist will identify boundaries of sensitive habitats and have the contractor fence the areas with orange construction fencing. Erosion control fencing will be placed at the edges of construction where the construction activities are upslope of wetlands and channels to prevent washing of sediments offsite. All fencing will be installed prior to any construction activities beginning and will be maintained throughout the construction period.

2. An environmental training program will be provided for all construction personnel prior to the start of construction activities. The program will provide workers with information on their responsibilities with regard to the special-status species, an overview of the life-history of the species, information on the protections afforded to these animals under the Act and take prohibitions, and an explanation of the relevant terms and conditions of this biological opinion. All on-site construction personnel shall be notified about the potential presence of special-status species and any special-status species encountered during construction shall be left unharmed. Written documentation of the training must be submitted to the Chief of the Endangered Species Division (Sacramento Valley) at the Sacramento Fish and Wildlife Office within 30 days of the completion of training.

3. All trash and construction debris will be removed following construction. Revegetation will occur on all areas temporarily disturbed during construction.

4. Fugitive dust emissions will be minimized by adhering to the Feather River Air Quality Management Districts requirements for the control of dust emissions.

Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp

1. Compensation at a ratio of 1:1 for creation and 3:1 for preservation will be done at an approved mitigation bank for direct effects. Indirect effects will be compensated at a ratio of 3:1 preservation at an approved mitigation bank.

2. A Stormwater Pollution Plan will be prepared for the proposed project, with the following objectives: (1) to identify pollutant sources, including sources of sediment, that may affect the quality of storm water discharges from the construction of the proposed project; (2) to identify Best Management Practices (BMPs) to reduce or eliminate pollutants in stormwater discharges and authorized non-stormwater discharges from the proposed project site during construction; (3) to outline and provide guidance for BMPs and stormwater monitoring; (4) to address post-construction BMP implementation and monitoring; and (5) to address sediment, siltation, turbidity, and non-visually detectable pollutant monitoring, and outline a sampling and analysis strategy.

3. Standard BMPs will be incorporated into all construction designs, plans, and specifications, and will be required of contractors during construction. The BMPs for the proposed project will include the following specific measures:

   Hydroseeding: All constructed slopes adjacent to the vernal pool preserves will be hydroseeded with a native grassland mix. The hydroseed will be applied with a tackifying agent at a rate of at least 2 tons per acre, and based on manufacture's recommendations. The tackifying agent will be a hydraulic matrix which when applied, and upon drying, adheres to the soil to form a 100 percent cover which is biodegradable, promotes vegetation, and prevents soil erosion. The hydroseed mix will not be applied before, during, or immediately after rainfall so that the matrix will have an opportunity to dry 24 hours after installation.

   Sediment and Erosion Control: Certified weed-free straw wattles will be installed at the base of all slopes adjacent to the opens space preserve, along the perimeters of the pond complex, and along of the property lines of the proposed project site. Prior to installation of the straw wattles, a concave key trench 2 to 4 inches deep will be contoured along the proposed installation route. Soil excavated for the trenching will be placed on the uphill or flow side of the straw wattles to prevent water from undercutting the straw wattles. Stakes will be driven in on alternating sides of the straw wattles, to hold them in place. The straw wattles will be maintained for a period of time as least until the native grassland vegetation is fully established and the soil is stabilized.

   Excavated Areas: During construction all excavated materials will be deposited or stored such that this material cannot be washed into any water sources, and excess supplies of certified weed-free straw bales and/or sediment fencing will be available at the construction site for periodic site-specific use as needed.

   Staging Areas: Staging areas for construction will be located so that spills of oil, grease, or other petroleum by-products will not be discharged into any watercourse or sensitive habitat. No refueling, storage, servicing, or maintenance of equipment will take place within 250 feet of the vernal pools. All machinery will be properly maintained and cleaned to prevent spills and leaks. Any spills or leaks will be

reported and cleaned up in accordance with applicable local, State, and/or Federal regulations.

Construction Fencing: Temporary fencing will be installed prior to construction along the boundaries of the construction zone to clearly mark this zone and to prevent construction equipment, vehicles, or construction personnel from entering into avoided vernal pool areas.

Valley Elderberry Longhorn Beetle

1. Pre-construction and post-construction surveys will be done of the elderberry shrubs in the project area. The post-construction survey will confirm that there was no additional damage to any of the elderberry shrubs than as described in this BO.

2. All areas to be avoided during construction activities will be fenced and flagged. In areas where encroachment on the 100-foot buffer has been approved by the Service, a minimum setback of at least 20 feet from the dripline of each elderberry plant will be provided.

3. Transplant 21 elderberry shrubs with 38 stems between 1 and 3 inches, 4 stems between 3 and 5 inches and 15 stems greater than 5 inches at ground level, and provide additional plantings as described in Service's 1999 *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (Conservation Guidelines).

4. To minimize for transplanting the elderberry shrubs outside of the transplant window described in the Conservation Guidelines, the number of additional elderberry seedlings and associated native plantings will be increased 2.5 times. TRLIA is planning on planting the elderberry seedlings and associated natives on the existing Bear River levee, planting will not occur until fall or winter of 2006 after the old Bear River levee has been decommissioned and the new setback levee is in place. Due to the delay in planting the elderberry seedlings and associated natives the number of elderberry seedlings and associated natives will be increased 2 times. The final number of elderberry seedlings and associated natives planted in fall of 2006 will be increased by 4.5 times.

5. A qualified biologist (monitor) will be on-site for the duration of the transplanting of the elderberry shrubs to ensure that no unauthorized take of the beetle occurs. If unauthorized take occurs, the monitor will have the authority to stop work until corrective measures have been completed. The monitor must immediately report any unauthorized take of the beetle or its habitat to the Service and to the California Department of Fish and Game.

6. Dust control measures will be employed during all construction activities.

7. No insecticides, herbicides, fertilizers, or other chemicals will be applied within 100 feet of an elderberry shrub during construction. All drainage water during and following construction will be diverted away from the elderberry shrubs.

Giant Garter Snake

1. At least 30 days prior to initiating construction activities, the project proponents will submit the names and curriculum vitae of the biological monitor(s) for the project to the Service for review and approval.

2. Within 24-hours prior to commencement of construction activities, the site will be inspected by a Service-approved biologist. The project area will be re-inspected by the monitoring biologist whenever a lapse in construction activity of two weeks or greater has occurred.

3. Prior to working in aquatic areas capable of supporting prey for the giant garter snake, the habitat shall be dewatered and remain dry for at least 15 consecutive days prior to excavation or filling. A Service-approved biological monitor will be present during all dewatering activities.

4. Most of the construction activity within snake habitat (*e.g.*, aquatic, upland, and rice habitat) would be conducted between May 1 and October 1. This is the active period for the snake and direct mortality is lessened because snakes are expected to actively move and avoid danger. More danger is posed to snakes during their inactive period because they are occupying underground burrows or crevices and are more susceptible to direct effects, especially during excavation activities. For work involving the tie in of the new setback levee to the Feather River levee, work is likely to extend past October 1. To minimize effects to snakes from work occurring during their less active period the following measures would apply: (1) work would only occur in areas that have been fenced with construction fencing and ground disturbing work has been occurring for two weeks prior to October 1; (2) a biological monitor would be on site every day and would perform a survey every morning prior to construction work beginning, to ensure there are no snakes in the area.

5. The project proponent(s) will meet water quality objectives through the implementation of construction provisions (Best Management Practices), precautions, and stipulations addressed in the Section 404 permit, the condition of the 401 Water Quality Certification and the 1601 Streambed Alteration Agreement.

6. Any areas of potential suitable habitat used by the snake within or adjacent to the project area will be flagged and designated as an Environmentally Sensitive Area (ESA). The area inside the ESA boundaries will not be disturbed during construction activities.

7. To eliminate an attraction to predators of the snake, all food-related trash items, such as wrappers, cans, bottles, and food scraps, must be disposed of in closed containers and removed at least every other day from the entire project site.

8. Impacts of temporary losses and degradation of habitat shall be minimized to the greatest extent practicable.

9. The project proponent(s) would not place any plastic, monofilament, jute, or similar erosion control matting that could entangle snakes on the project site.

10. The project proponent(s) would maintain and monitor the project site for one year following the completion of construction and restoration activities. Monitoring reports documenting the restoration effort should be submitted to the Service upon the completion of the restoration implementation and one year after the restoration implementation. Monitoring reports should include photo-documentation, when restoration was completed, what materials were used, specific plantings, and justifications of any substitutions to the Service-recommended guidelines.

11. After completion of construction activities, the project proponent(s) would remove any temporary fill, stockpiled materials, trash, and construction debris. The proposed area would be regraded to its preexisting contour, or to a contour that would improve the restoration potential of the project site. The project area would be reseeded with erosion control seeding consisting of a sterile, non-proliferating grass species. The seed mix shall not contain fertilizers or chemicals. The project proponent(s) would restore all temporarily disturbed snake habitat (including aquatic and upland habitats) within the same construction season (*i.e.*, May 1 through October 1) that disturbance occurs and according to the *Guidelines for Restoration and/or Replacement of Giant Garter Snake Habitat.*

12. Movement of heavy equipment to and from the project site will be restricted to established roadways to minimize habitat disturbance. Stockpiling of construction materials, including portable equipment, vehicles, and supplies, will be restricted to the designated construction staging area and exclusive of wetland avoidance areas. Snake habitat adjacent to the project area will be flagged and avoided by all construction personnel.

13. The applicant will restore 96.12 acres (38.90 ha) of temporarily affected snake habitat, including 0.36 ac (0.14 ha) of aquatic habitat and 95.76 ac (38.75 ha) of upland habitat, would be restored according the *Guidelines for Restoration and/or Replacement of Giant Garter Snake Habitat* (Appendix A) and the *Standard Avoidance and Minimization Measures During Construction Activities in Giant Garter Snake (Thamnophis gigas) Habitat* (Appendix C).

14. Permanent loss of giant garter snake habitat will be compensated for at a ratio of 3:1 at a Service approved mitigation bank.

STATUS OF THE SPECIES AND ENVIRONMENTAL BASELINE

Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp

Status of the Species

The vernal pool tadpole shrimp and vernal pool fairy shrimp were listed as endangered and threatened, respectively, on September 19, 1994. Complete descriptions of these species are found in the final rule listing these species under the Act (Service 1994). These branchiopods are restricted to vernal pools and swales and other seasonal aquatic habitats. The vernal pool fairy shrimp is found in California and southern Oregon, and the vernal pool tadpole shrimp is found in California. Eng *et al.* (1990) and Simovich *et al.* (1992) provide further details about their life history and ecology.

Life history of vernal pool tadpole shrimp - The vernal pool tadpole shrimp has dorsal compound eyes, a large shield-like carapace that covers most of its body, and a pair of long cercopods at the end of its last abdominal segment (Linder 1952; Longhurst 1955; Pennak 1989). It is primarily a benthic animal that swims with its legs down. Vernal pool tadpole shrimp climb or scramble over objects, and plow along bottom sediments as they forage for food. Its diet consists of organic detritus and living organisms, such as fairy shrimp and other invertebrates (Pennak 1989; Fryer 1987). The females deposit their eggs on vegetation and other objects on the pool bottom. Tadpole shrimp eggs are known as cysts, and during the dry months of the year, they lie dormant in the dry pool sediments (Lanaway 1974; Ahl 1991).

The life history of the vernal pool tadpole shrimp is linked to the environmental characteristics of its vernal pool habitat. After winter rains fill the pools, dormant vernal pool tadpole shrimp cysts may hatch in as little as four days (Ahl 1991; Rogers in litt. 2001), and tadpole shrimp may become sexually mature within three to four weeks after hatching (Ahl 1991; Helm 1998; King 1996). A portion of the cysts hatch immediately and the rest remain dormant in the soil to hatch during later rainy seasons (Ahl 1991). The vernal pool tadpole shrimp is a relatively long-lived species (Ahl 1991), and will generally survive for as long as their habitats remain inundated, sometimes for six months or more (Ahl 1991; Gallagher 1996; Helm 1998). Adults are often present and reproductive until the pools dry up in the spring (Ahl 1991; Simovich *et al.* 1992). Mature adults may be present in pools until the habitats dry up in the spring (Ahl 1991; Gallagher 1996; Simovich *et al.* 1992).

Life history of vernal pool fairy shrimp - Vernal pool fairy shrimp have delicate elongate bodies, large stalked compound eyes, no carapace, and 11 pairs of phyllopods, or gill-like structures that also serve as legs. The swim or glide gracefully upside-down by means of complex, wavelike beating movements. Fairy shrimp feed on algae, bacteria, protozoa, rotifers, and detritus. The second pair of antennae in fairy shrimp adult males are greatly enlarged and specialized for clasping the females during copulation. The females carry eggs in an oval or elongate ventral brood sac. The eggs are either dropped to the pool bottom or remain in the brood sac until the female dies and sinks. The dormant cysts are capable of withstanding heat, cold, and prolonged

desiccation, and they can remain viable in the soil for decades after deposition. When the pools refill in the same or subsequent seasons, some, but not all, of the cysts may hatch. The cyst bank in the soil may therefore be comprised of cysts from several years of breeding (Donald 1983). The early stages of the fairy shrimp develop rapidly into adults. The vernal pool fairy shrimp can mature quickly, allowing populations to persist in short-lived shallow pools (Simovich *et al.* 1992). In pools that persist for several weeks to a few months, fairy shrimp may have multiple hatches during a single season (Helm 1998; Gallagher 1996).

Vernal Pool Ecology and Species Adaptations – The hydrology that maintains the pattern of inundation and drying characteristic of vernal pool habitats is complex. Vernal pool habitats form in depressions above an impervious soil layer (duripan) or rock substrate. After winter rains begin, this impervious layer prevents the downward percolation of water and creates a perched water table causing the depression (or pool) to fill. Due to local topography and geology, the depressions are generally part of an undulating landscape, where soil mounds are interspersed with basins, swales, and drainages (Nikiforoff 1941; Holland and Jain 1978). These features form an interconnected hydrological unit known as a vernal pool complex. Although vernal pool hydrology is driven by the input of precipitation, water input to vernal pool basins also occurs from surface and subsurface flow from the swale and upland portions of the complex (Zedler 1987; Hanes *et al.* 1990; Hanes and Stromberg 1998). Surface flow through the swale portion of the complex allows vernal pool species to move directly from one vernal pool to another. Upland areas are a critical component of vernal pool hydrology because they directly influence the rate of vernal pool filling, the length of the inundation period, and the rate of vernal pool drying (Zedler 1987; Hanes and Stromberg 1998). Upland areas associated with vernal pools are also an important source of nutrients to vernal pool organisms (Wetzel 1975). Vernal pool habitats derive most of their nutrients from detritus that is washed into the pool from adjacent uplands, and these nutrients provide the foundation for the vernal pool aquatic community food chain.

Both of the vernal pool crustaceans addressed in this biological opinion have evolved unique physical adaptations to survive in vernal pools. Vernal pool environments are characterized by a short inundation phase during the winter, a drying phase during the spring, and a dry phase during the summer (Holland and Jain 1978). The timing and duration of these phases can vary significantly from year to year, and in some years vernal pools may not inundate at all. In order to take advantage of the short inundation phase, vernal pool crustaceans have evolved short reproduction times and high reproductive rates. The listed crustaceans generally hatch within a few days after their habitats fill with water, and can start reproducing within a few weeks (Eng *et al.* 1990; Helm 1998; Eriksen and Belk 1999). Vernal pool crustaceans can complete their entire life cycle in a single season, and some species may complete several life cycles. Vernal pool crustaceans can also produce numerous offspring when environmental conditions are favorable. Some species may produce thousands of cysts during their life spans.

To survive the prolonged heat and desiccation of the vernal pool dry phase, vernal pool crustaceans have developed a dormant stage. The dormant egg, or cyst, can withstand temperatures near boiling (Carlisle 1968), fire (Wells *et al.* 1997), freezing, and anoxic conditions without damage to the embryo. The cyst wall cannot be affected by digestive enzymes, and can be transported in the digestive tracts of animals without harm (Horne 1967). Most fairy shrimp cysts can remain viable in the soil for a decade or longer (Belk 1998). Because the cyst contains a well developed embryo, the animal can quickly develop into a fully mature adult. This allows vernal pool crustaceans to reproduce before the vernal pool enters the dry phase, sometimes within only a few weeks (Helm 1998; Eriksen and Belk 1999). In some species, cysts may hatch immediately without going through a dormant stage, if they are deposited while the vernal pool still contains water. These cysts are referred to as quiescent, and allow the vernal pool crustacean to produce multiple generations in a single wet season as long as their habitat remains inundated.

Distribution of vernal pool tadpole shrimp - Vernal pool tadpole shrimp are found only in ephemeral freshwater habitats in California. The vernal pool tadpole shrimp is known from 168 occurrences in the Central Valley (CNDDB 2005), ranging from east of Redding in Shasta County south to Fresno County, and from a single vernal pool complex located in the San Francisco Bay National Wildlife Refuge in Alameda County. It inhabits vernal pools containing clear to highly turbid water, ranging in size from 54 square feet in the Mather Air Force Base area of Sacramento County, to the 89-acre Olcott Lake at Jepson Prairie in Solano County. Although vernal pool tadpole shrimp are found on a variety of geologic formations and soil types, Helm (1998) found that over 50 percent of vernal pool tadpole shrimp occurrences were on High Terrace landforms and Redding and Corning soils.

Based on genetic differences, King (1996) separated vernal pool tadpole shrimp populations into two distinct groups. One group was comprised of animals inhabiting the floor of the Central Valley, near the Sacramento and San Joaquin Rivers. The other group contained vernal pool tadpole shrimp from sites along the eastern margin of the valley. King (1996) concluded that these two groups may have diverged because cyst dispersal by overland flooding historically connected populations on the valley floor, while populations on the eastern margin of the valley were not periodically connected by large scale flooding, and were therefore historically more isolated. When dispersal of these foothill populations occurred, it was probably through different mechanisms such as migratory birds.

Distribution of vernal pool fairy shrimp - Vernal pool fairy shrimp are found only in ephemeral freshwater habitats in California and Southern Oregon. The vernal pool fairy shrimp is known from 342 occurrences extending from the Stillwater Plain in Shasta County through most of the length of the Central Valley to Pinnacles in San Benito County (Eng *et al.* 1990; Fugate 1992; Sugnet and Associates 1993; CNDDB 2005). Five additional, disjunct populations exist: one near Soda Lake in San Luis Obispo County; one in the mountain grasslands of northern Santa Barbara County; one on the Santa Rosa Plateau in Riverside County; one near Rancho California in Riverside County; and one on the Agate Desert near Medford, Oregon. Three of these isolated populations each contain only a single pool known to be occupied by the vernal pool fairy shrimp. The vernal pool fairy shrimp inhabits vernal pools with clear to tea-colored water, most

commonly in grass- or mud-bottomed swales, basalt flow depression pools in unplowed grasslands, or even sandstone rock outcrops or alkaline vernal pools.

Although the vernal pool crustaceans addressed in this biological opinion are not often found in the same vernal pool at the same time, when coexistence does occur, it is generally in deeper, longer lived pools (Eng *et al.* 1990; Thiery 1991; Gallagher 1996; Simovich 1998). In larger pools, vernal pool crustacean species may be able to coexist by utilizing different physical portions of the vernal pool or by eating different food sources (Daborn 1978; Mura 1991; Hamer and Appleton 1991; Thiery 1991), or by hatching at different temperatures or developing at different rates (Thiery 1991; Hathaway and Simovich 1996).

Dispersal - The primary historic dispersal method for the vernal pool tadpole shrimp and vernal pool fairy shrimp likely was large scale flooding resulting from winter and spring rains which allowed the animals to colonize different individual vernal pools and other vernal pool complexes (J. King, pers. comm., 1995). This dispersal is currently non-functional due to the construction of dams, levees, and other flood control measures, and widespread urbanization within significant portions of the range of this species. Waterfowl and shorebirds may now be the primary dispersal agents for vernal pool tadpole shrimp and vernal pool fairy shrimp. The eggs of these branchiopods are either ingested (Krapu 1974; Swanson *et al.* 1974; Driver 1981; Ahl 1991) and/or adhere to the legs and feathers where they are transported to new habitats. Cysts may also be dispersed by a number of other species, such as salamanders, toads, cattle, and humans (Eriksen and Belk 1999).

Vernal pool crustaceans are often dispersed from one pool to another through surface swales that connect one vernal pool to another. These dispersal events allow for genetic exchange between pools and create a population of animals that extends beyond the boundaries of a single pool. Instead, populations of vernal pool crustaceans are defined by the entire vernal pool complex in which they occur (Simovich *et al.* 1992; King 1996). These dispersal events also allow vernal pool crustaceans to move into pools with a range of sizes and depths. In dry years, animals may only emerge in the largest and deepest pools. In wet years, animals may be present in all pools, or in only the smallest pools. The movement of vernal pool crustaceans into vernal pools of different sizes and depths allows these species to survive the environmental variability that is characteristic of their habitats.

Reasons for Decline and Threats to Survival - The genetic characteristics of these species, as well as ecological conditions, such as watershed continuity, indicate that populations of vernal pool crustaceans are defined by pool complexes rather than by individual vernal pools (Fugate 1992). Therefore, the most accurate indication of the distribution and abundance of these species is the number of inhabited vernal pool complexes. The pools and, in some cases, pool complexes supporting these species may be small. Human-caused and unforeseen natural catastrophic events such as long-term drought, non-native predators, off-road vehicles, pollution, berming, and urban development, threaten their extirpation at some sites. Vernal pool fairy shrimp and vernal pool tadpole shrimp continue to be threatened by all of the factors which led to the

original listing of this species, primarily habitat loss through agricultural conversion and urbanization (CNDDB 2005).

Environmental Baseline

Historically, vernal pools and vernal pool complexes occurred extensively throughout the Sacramento Valley of California. Conversion of vernal pools and vernal pool complexes, however, has resulted in a 91 percent loss of vernal pool resources in California (State of California 2003d). By 1973, between 60 and 85 percent of the area within the Central Valley that once supported vernal pools had been destroyed (Holland 1978). In subsequent years, threats to this habitat type have continued and resulted in a substantial amount of vernal pool habitat being converted for human uses in spite of Federal regulations implemented to protect wetlands. For example, between 1987 and 1992, 467 acres of wetlands within the Sacramento area were filled pursuant to Nationwide Permit 26 (Service 1992). A majority of those wetlands losses involved vernal pools, the endemic habitat of the vernal pool tadpole shrimp, the vernal pool fairy shrimp and slender and Sacramento Orcutt grasses. It is estimated that within 20 years human activities will destroy 60 to 70 percent of the remaining vernal pools (Coe 1988).

In addition to direct habitat loss, the two shrimp populations have been and continue to be highly fragmented throughout their ranges due to conversion of natural habitat for urban and agricultural uses. Fragmentation results in small isolated shrimp populations. Ecological theory predicts that such populations will be highly susceptible to extirpation due to chance events, inbreeding depression, or additional environmental disturbance (Gilpin and Soulé 1988; Goodman 1987a, b). If an extirpation event occurs in a population that has been fragmented, the opportunities for re-colonization would be greatly reduced due to physical (geographic) isolation from other (source) populations.

The proposed project is located in southern Yuba County, which is within the northern portion of the Southeastern Sacramento Valley Vernal Pool Region and the southern portion of the Northern Eastern Sacramento Valley Vernal Pool Region (Keeler-Wolf *et al.* 1998). In Yuba County, between 1995 and 1997, vernal pool acres declined at a rate of 1.47 percent per year, down from 12,229 ac (4,949 ha) to 11,871 ac (4,804 ha). To date, past section 7 consultations have resulted in projects in Yuba County affecting approximately 1,300 ac (526 ha).

The vernal pool fairy shrimp is known from 34 populations extending from Shasta County south through the Central Valley to Tulare County. This species also occurs along the central coast from northern Solano County south to San Benito County. Vernal pool tadpole shrimp are known from 19 populations in Central Valley, ranging from Shasta County south to Fresno County, with one disjunct population in Alameda County. Yuba County represents only 0.005 percent of the 366 known occurrences of vernal pool fairy shrimp and 0.04 percent of the known occurrences of 209 vernal pool tadpole shrimp (CNDDB 2005). Although Yuba County does not appear to represent important habitat for the vernal pool tadpole shrimp and the vernal pool fairy, the existing vernal pool habitats in Yuba County are crucial to the persistence of these listed species within Yuba County itself.

The fate of these remaining fragments of ephemeral wetlands for the listed vernal pool branchiopods is threatened by direct and indirect effects of urbanization, mining, and conversion to vineyards, as well as by their isolation. The increased urban development and conversion of agricultural lands has resulted in the loss of vernal pool resources. Historically, California has lost an estimated 91 percent of vernal pool resources (State of California 2003). The vernal pool tadpole shrimp and vernal pool fairy shrimp are imperiled by a variety of human-caused activities. Their habitats have been lost through direct destruction and modification due to filling, grading, disking, leveling, and other activities. In addition, vernal pools have been imperiled by a variety of anthropogenic modifications to upland habitats and watersheds. These activities, primarily urban development, water supply/flood control projects, land conversion for agriculture, off-road vehicle use, certain mosquito abatement measures, and pesticide/herbicide use can lead to disturbance of natural flood regimes, changes in water table depth, alterations of the timing and duration of vernal pool inundation, introduction of non-native plants and animals, and water pollution. These indirect effects can result in adverse effects to vernal pool species.

A number of State, local, private, and unrelated Federal actions have occurred within the project area and adjacent region affecting the environmental baseline of these species. Some of these projects have been subject to prior section 7 consultation. These actions have resulted in both direct and indirect impacts to vernal pools within the region, and have contributed to the loss of vernal pool tadpole shrimp and vernal pool fairy shrimp populations. Although a reduction of federally-listed vernal pool branchiopod populations has not been quantified, the acreage of lost habitat continues to grow.

CNDDB (2004) indicates six locality records of the vernal pool fairy shrimp and two records of the vernal pool tadpole shrimp in Yuba County. Most of these records are from the Beale Air Force Base, located approximately 10-11 miles (16-17.7 km) east of the proposed project site. Seasonal wetlands and seasonal ponds are located on the proposed project site. Wet-season sampling for listed branchiopods were completed by Jones and Stokes on March 17, 2004, in three of the seasonal wetlands. Vernal pool tadpole shrimp were observed in the project area in one of the seasonal wetlands. Because vernal pool fairy shrimp are known to occur in the vicinity of the proposed project, all of the on-site seasonal wetlands and seasonal ponds identified during the field evaluation are considered suitable habitat for the vernal pool fairy shrimp and vernal pool tadpole shrimp. Based on this information the Service has determined that there is a high likelihood that the vernal pool fairy shrimp inhabit the proposed project site and the vernal pool tadpole shrimp does inhabit the proposed project site.

Valley Elderberry Longhorn Beetle

Status of the Species

The beetle was listed as a threatened species under the Act on August 8, 1980 (45 FR 52803). Critical habitat for the species was designated and published at 50 CFR §17.95. Two areas along the American River in the Sacramento metropolitan area have been designated as critical habitat for the beetle. Critical habitat for this species has been designated along the lower American River at Goethe and Ancil Hoffman parks (American River Parkway Zone) and at the

Sacramento Zone, an area about a half mile from the American River downstream from the American River Parkway Zone. In addition, an area along Putah Creek, Solano County, and the area west of Nimbus Dam along the American River Parkway, Sacramento County, are considered essential habitat, according to the Valley Elderberry Longhorn Beetle Recovery Plan (Service 1984). These critical habitat and essential habitat areas within the American River parkway and Putah Creek support large numbers of mature elderberry shrubs with extensive evidence of use by the beetle.

The beetle is dependent on the elderberry, its host plant, which is a locally common component of the remaining riparian forests and savannah areas and, to a lesser extent, the mixed chaparral-foothill woodlands of the Central Valley. Use of the elderberry shrubs by the animal, a wood borer, is rarely apparent. In most cases, the only exterior evidence of the shrub's use by the beetle is an exit hole created by the larva just prior to the pupal stage. Observations made within elderberry shrubs along the Cosumnes River, in the Folsom Lake area, and near Blue Ravine in Folsom indicate that larval galleries can be found in elderberry stems with no evidence of exit holes; the larvae either succumb prior to constructing an exit hole or are not far enough along in the developmental process to construct an exit hole. Beetle larvae appear to be distributed in stems which are 1.0 inch or greater in diameter at ground level. The Valley Elderberry Longhorn Beetle Recovery Plan (Service 1984) and Barr (1991) contain further details on the valley elderberry longhorn beetle's life history.

Population densities of the beetle are probably naturally low (Service 1984). It has been suggested, based on the spatial distribution of occupied shrubs (Barr 1991), that the beetle is a poor disperser (Collinge *et al.* 2001). Low density and limited dispersal capability cause the beetle to be vulnerable to the negative effects of the isolation of small subpopulations due to habitat fragmentation.

When the beetle was listed as threatened in 1980, the species was known from less than ten localities along the American River, the Merced River, and Putah Creek. By the time the Valley Elderberry Longhorn Beetle Recovery Plan was prepared in 1984; additional occupied localities had been found along the American River and Putah Creek. As of 2005, the California Natural Diversity Database (CNDDB 2005) contained 190 occurrences for this species in 44 drainages throughout the Central Valley, from a location along the Sacramento River in Shasta County, southward to an area along Caliente Creek in Kern County (CNDDB 2005). The beetle continues to be threatened by habitat loss and fragmentation, predation by the non-native Argentine ants (*Linepithema humile*) (Holway 1998; Huxel 2000; Huxel and Hastings 1999; Ward 1987), and possibly other factors such as pesticide drift, non-native plant invasion, improper burning regimes, off-road vehicle use, rip-rap bank protection projects, wood cutting, and over-grazing by livestock (CNDDB 2005).

Environmental Baseline

Riparian forests, the primary habitat for the beetle, have been severely depleted throughout the Central Valley over the last two centuries as a result of expansive agricultural and urban development (Katibah 1984; Roberts *et al.* 1977; Thompson 1961). Since colonization, these

forests have been "...modified with a rapidity and completeness matched in few parts of the United States" (Thompson 1961). As of 1849, the rivers and larger streams of the Central Valley were largely undisturbed. They supported continuous bands of riparian woodland four to five miles in width along some major drainages such as the lower Sacramento River, and generally about two miles wide along the lesser streams (Thompson 1961). Most of the riverine floodplains supported riparian vegetation to about the 100-year flood line (Katibah 1984). A large human population influx occurred after 1849, however, and much of the Central Valley riparian habitat was rapidly converted to agriculture and used as a source of wood for fuel and construction to serve a wide area (Thompson 1961). By as early as 1868, riparian woodland had been severely affected in the Central Valley, as evidenced by the following excerpt:

> "This fine growth of timber which once graced our river [Sacramento], tempered the atmosphere, and gave protection to the adjoining plains from the sweeping winds, has entirely disappeared - the woodchopper's axe has stripped the river farms of nearly all the hard wood timber, and the owners are now obliged to rely upon the growth of willows for firewood" (Cronise 1868, in Thompson 1961).

The clearing of riparian forests for fuel and construction made land available for agriculture (Thompson 1977). Natural levees bordering the rivers, once supporting vast tracts of riparian habitat, became prime agricultural land (Thompson 1961). As agriculture expanded in the Central Valley, needs for increased water supply and flood protection spurred water development and reclamation projects. Artificial levees, river channelization, dam building, water diversion, and heavy groundwater pumping further reduced riparian habitat to small, isolated fragments (Katibah 1984). In recent decades, these riparian areas have continued to decline as a result of ongoing agricultural conversion as well and urban development and stream channelization. As of 1989, there were over 100 dams within the Central Valley drainage basin, as well as thousands of miles of water delivery canals and streambank flood control projects for irrigation, municipal and industrial water supplies, hydroelectric power, flood control, navigation, and recreation (Frayer *et al.* 1989). Riparian forests in the Central Valley have dwindled to discontinuous strips of widths currently measurable in yards rather than miles.

Some accounts state that the Sacramento Valley supported approximately 775,000 to 800,000 acres of riparian forest as of approximately 1848, just prior to statehood (Smith 1977; Katibah 1984). No comparable estimates are available for the San Joaquin Valley. Based on early soil maps, however, more than 921,000 acres of riparian habitat are believed to have been present throughout the Central Valley under pre-settlement conditions (Katibah 1984). Another source estimates that of approximately five million acres of wetlands in the Central Valley in the 1850s, approximately 1,600,000 acres were riparian wetlands (Warner and Hendrix 1985; Frayer *et al.* 1989).

Based on a California Department of Fish and Game riparian vegetation distribution map, by 1979, there were approximately 102,000 acres of riparian vegetation remaining in the Central Valley. This represents a decline in acreage of approximately 89 percent (Katibah 1984). More extreme figures were given by Frayer *et al.* (1989), who reported that woody riparian forests in the Central Valley had declined to 34,600 acres by the mid-1980s (from 65,400 acres in 1939).

Although these studies have differing findings in terms of the number of acres lost (most likely explained by differing methodologies), they attest to a dramatic historic loss of riparian habitat in the Central Valley. As there is no reason to believe that riparian habitat suitable to the beetle (elderberry shrubs) would be destroyed at a different rate than other riparian habitat, we can assume that the rate of loss for beetle habitat in riparian areas has been equally dramatic.

A number of studies have focused on riparian vegetation losses along the Sacramento River, which supports some of the densest known populations of the beetle. Approximately 98 percent of the middle Sacramento River's historic riparian vegetation was believed to have been extirpated by 1977 (DWR 1979). The State Department of Water Resources estimated that native riparian habitat along the Sacramento River from Redding to Colusa decreased from 27,720 acres to 18,360 acres (34 percent) between 1952 and 1972 (McGill 1975; Conrad *et al.* 1977). The average rate of riparian loss on the middle Sacramento River was 430 acres per year from 1952 to 1972, and 410 acres per year from 1972 to 1977. In 1987, riparian areas as large as 180 acres were observed converted to orchards along this River (McCarten and Patterson 1987).

Barr (1991) examined 79 sites in the Central Valley supporting valley elderberry longhorn beetle habitat. When 72 of these sites were re-examined by researchers in 1997, seven no longer supported valley elderberry longhorn beetle habitat. This loss represents a decrease in the number of sites with valley elderberry longhorn beetle habitat by approximately nine percent in six years.

No comparable information exists on the historic loss of non-riparian valley elderberry longhorn beetle habitat such as elderberry savanna and other vegetation communities where elderberry shrubs also occur (oak or mixed chaparral-woodland, or grasslands adjacent to riparian habitat). However, all natural habitats throughout the Central Valley have been heavily adversely affected within the last 200 years (Thompson 1961), and we can therefore assume that non-riparian beetle habitat also has suffered a widespread decline. This analysis focuses on loss of riparian habitat because the beetle is primarily dependent upon riparian habitat. Adjacent upland areas are also likely to be important for the species, but this upland habitat typically consists of oak woodland or elderberry savanna bordering willow riparian habitat (Barr 1991). The riparian acreage figures given by Frayer *et al.* (1989) and Katibah (1984) included oak woodlands concentrated along major drainages in the Central Valley, and therefore probably included lands we would classify as upland habitat for the beetle adjacent to riparian drainages.

Between 1980 and 1995, the human population in the Central Valley grew by 50 percent, while the rest of California grew by 37 percent . The Central Valley's population was 4.7 million by 1999, and it is expected to more than double by 2040. The American Farmland Trust estimates that by 2040, more than 1 million cultivated acres will be lost and 2.5 million more put at risk (Ritter 2000). With this growing population in the Central Valley, increased development pressure is likely to result in continuing loss of riparian habitat.

While habitat loss is clearly a large factor leading to the species' decline, other factors are likely to pose significant threats to the long term survival of the beetle. Only approximately 20 percent

of riparian sites with elderberry observed by Barr (1991) and Collinge *et al.* (2001) support beetle populations (Barr 1991, Collinge *et al.* 2001). Jones and Stokes (1988) found 65 percent of 4,800 riparian acres on the Sacramento River have evidence of beetle presence. The fact that a large percentage of apparently suitable habitat is unoccupied suggests that the beetle is limited by factors other than habitat availability, such as habitat quality or limited dispersal ability.

Destruction of riparian habitat in central California has resulted not only in a significant acreage loss, but also has resulted in beetle habitat fragmentation. Fahrig (1997) states that habitat fragmentation is only important for habitats that have suffered greater than 80 percent loss. Riparian habitat in the Central Valley, which has experienced greater than 90 percent loss by most estimates, would meet this criterion as habitat vulnerable to effects of fragmentation. Existing data suggests that beetle populations, specifically, are affected by habitat fragmentation. Barr (1991) found that small, isolated habitat remnants were less likely to be occupied by beetles than larger patches, indicating that valley elderberry longhorn beetle subpopulations are extirpated from small habitat fragments. Barr (1991) and Collinge *et al.* (2001) consistently found valley elderberry longhorn beetle exit holes occurring in clumps of elderberry bushes rather than isolated bushes, suggesting that isolated shrubs do not typically provide long-term viable habitat for this species. Local populations of organisms often undergo periodic colonization and extinction, while the metapopulation (set of spatially separated groups of a species) may persist (Collinge 1996).

Habitat fragmentation can be an important factor contributing to species declines because: (1) it divides a large population into two or more small populations that become more vulnerable to direct loss, inbreeding depression, genetic drift, and other problems associated with small populations; (2) it limits a species' potential for dispersal and colonization; and (3) it makes habitat more vulnerable to outside influences by increasing the edge:interior ratio (Primack 1998).

Small, isolated subpopulations are susceptible to extirpation from random demographic, environmental, and/or genetic events (Shaffer 1981; Lande 1988; Lande 1993; Primack 1998). While a large area may support a single large population, the smaller subpopulations that result from habitat fragmentation may not be large enough to persist over a long time period. As a population becomes smaller, it tends to lose genetic variability through genetic drift, leading to inbreeding depression and a lack of adaptive flexibility. Smaller populations also become more vulnerable to random fluctuations in reproductive and mortality rates, and are more likely to be extirpated by random environmental factors.

The beetle is a specialist on elderberry plants, and tends to have small population sizes and occurs in low densities (Barr 1991; Collinge *et al.* 2001). Collinge *et al.* (2001) compared resource use and density of exit holes between the beetle and a related subspecies, the California elderberry longhorn beetle (*Desmocerus californicus californicus*). The valley elderberry longhorn beetle tended to occur in areas with higher elderberry densities, but had lower exit hole densities than the California elderberry longhorn beetle. With extensive riparian habitat loss and fragmentation, these naturally-small valley elderberry longhorn beetle populations are broken into even smaller, isolated populations. Once a small valley elderberry longhorn beetle

population has been extirpated from an isolated habitat patch, the species may be unable to re-colonize this patch if it is unable to disperse from nearby occupied habitat. Insects with limited dispersal and colonization abilities may persist better in large habitat patches than small patches because small fragments may be insufficient to maintain viable populations and the insects may be unable to disperse to more suitable habitat (Collinge 1996).

Studies suggest that the beetle is unable to re-colonize drainages where the species has been extirpated, because of its limited dispersal ability (Barr 1991; Collinge *et al.* 2001). Huxel and Hastings (1999) used computer simulations of colonization and extinction patterns based on differing dispersal distances, and found that the short dispersal simulations best matched the 1997 census data in terms of site occupancy. This suggests that dispersal and colonization are limited to nearby sites. At spatial scales greater than 6.2 miles, such as across drainages, valley elderberry longhorn beetle occupancy appears to be strongly influenced by regional extinction and colonization processes, and colonization is constrained by limited dispersal (Collinge *et al.* 2001; Huxel and Hastings 1999). Except for one occasion, drainages examined by Barr that were occupied in 1991 remained occupied in 1997 (Collinge *et al.* 2001; Huxel and Hastings 1999). The one exception was Stoney Creek, which was occupied in 1991 but not in 1997. All drainages found by Barr (1991) to be unoccupied in 1991 were also unoccupied in 1997. This data suggests that drainages unoccupied by the valley elderberry longhorn beetle remain so. Habitat fragmentation not only isolates small populations, but also increases the interface between habitat and urban or agricultural land, increasing negative edge effects such as the invasion of non-native species and pesticide contamination (Barr 1991). Several edge effect-related factors may be related to the decline of the valley elderberry longhorn beetle.

Evidence of the beetle, in the form of exit holes, was found within the proposed project area during the elderberry shrub survey. Elderberry shrubs with stems one inch or greater in diameter that provide suitable habitat are found in and adjacent to the action area. The action area contains components that can be used by the listed animal for feeding, resting, mating, and other essential behaviors. Therefore, the Service believes that the valley elderberry longhorn beetle is reasonably certain to occur within the action area because of the biology and ecology of the animal, the presence of suitable habitat in and adjacent to the action area, as well as recent observations of this listed species.

Giant Garter Snake

Status of the Species

Listing. The Service published a proposal to list the giant garter snake as an endangered species on December 27, 1991 (56 **FR** 67046). The Service reevaluated the status of the snake before adopting the final rule. The snake was listed as a threatened species on October 20, 1993 (58 **FR** 54053).

Description. The giant garter snake is one of the largest garter snakes species reaching a total length of approximately 64 inches (162 centimeters). Females tend to be slightly longer and proportionately heavier than males. The weight of adult female snakes is typically 1.1-1.5

pounds (500-700 grams). Dorsal background coloration varies from brown to olive with a cream, yellow, or orange dorsal stripe and two light colored lateral stripes. Some individuals have a checkered pattern of black spots between the dorsal and lateral stripes. Background coloration and prominence of the checkered pattern and three yellow stripes are geographically and individually variable; individuals in the northern Sacramento Valley tend to be darker with more pronounced mid-dorsal and lateral stripes (Hansen 1980; Rossman et al. 1996). Ventral coloration is variable from cream to orange to olive-brown to pale blue with or without ventral markings (Hansen 1980).

Historical and Current Range. Giant garter snakes formerly occurred throughout the wetlands that were extensive and widely distributed in the Sacramento and San Joaquin Valley floors of California (Fitch 1940; Hansen and Brode 1980; Rossman & Stewart 1987). The historical range of the snake is thought to have extended from the vicinity of Chico, Butte County, southward to Buena Vista Lake, near Bakersfield, in Kern County (Fitch 1940; Fox 1951; Hansen and Brode 1980; Rossman and Stewart 1987). Early collecting localities of the giant garter snake coincide with the distribution of large flood basins, particularly riparian marsh or slough habitats and associated tributary streams (Hansen and Brode 1980).

Loss of habitat due to agricultural activities and flood control have extirpated the snake from the southern one third of its range in former wetlands associated with the historic Buena Vista, Tulare, and Kern lake beds (Hansen and Brode 1980; Hansen 1980). By 1971, so much wetland habitat had been reclaimed, that the California Department of Fish and Game (CDFG) classified the giant garter snake as a rare animal and conducted a series of field surveys. The results of these surveys indicate that snake populations were distributed in marsh wetlands, tributary streams, and portions of the rice productions zones of the Sacramento Valley in Butte, Glenn, Colusa, Sutter, Yolo and Sacramento Counties, in the Delta region along the eastern fringes of the Sacramento-San Joaquin River Delta in Solano, Contra Costa, Sacramento, and San Joaquin Counties, and in the San Joaquin Valley in San Joaquin, Stanislaus, Merced, Mendota, and Fresno Counties (Hansen & Brode 1980; Hansen 1988).

Upon federal listing in 1993, the Service identified 13 separate populations of giant garter snakes, with each population representing a cluster of discrete locality records (Service 1993). The 13 populations largely coincide with historical flood basins and tributary streams throughout the Central Valley: (1) Butte Basin, (2) Colusa Basin, (3) Sutter Basin, (4) American Basin, (5) Yolo Basin/Willow Slough, (6) Yolo Basin/Liberty Farms, (7) Sacramento Basin, (8) Badger Creek/Willow Creek, (9) Caldoni Marsh/White Slough, (10) East Stockton--Diverting Canal & Duck Creek, (11) North and South Grasslands, (12) Mendota, and (13) Burrel/Lanare.

A population is a group of organisms that interbreed and share a gene pool. The boundaries of a population, both in space and time, are generally not discrete and, in practice, as usually defined by the researcher (Krebbs 1994). The gene pool and breeding patterns of the 13 giant garter snake populations identified in the final rule remain unstudied and unknown. What was described as "13 populations" should therefore be described more accurately as sub-populations and occurrences that note observations of individuals about which much remains unknown (Service 2003).

Surveys over the last 25 years suggest that sub-populations of giant garter snake in the northern parts of its range, (Butte, Colusa, and Sutter Counties) are relatively large and stable (Wylie et al. 1997a; Wylie et al. 2003a). However, habitat corridors connecting sub-populations are either not present or not protected, and urban encroachment increases as a serious threat (Service 2003). Sub-populations in Yolo, Sacramento, Solano, and San Joaquin Counties areas are small, fragmented, and threatened by urbanization (Service 2003; Hansen 2004). Those sub-populations in the San Joaquin Valley, however, are most vulnerable having suffered near-devastating declines and possible extirpations over the last two decades (including populations in Stanislaus, Merced, Madera and Fresno Counties) (Hansen 1988; Dickert 2002, 2003; Williams & Wunderlich 2003). These sub-populations are extremely small, distributed discontinuously in isolated patches, and therefore are highly vulnerable to extinction by random environmental, demographic, and genetic processes (Goodman 1987).

Essential Habitat Components. Endemic to wetlands in the Sacramento and San Joaquin valleys, the giant garter snake inhabits marshes, sloughs, ponds, small lakes, low gradient streams, and other waterways and agricultural wetlands, such as irrigation and drainage canals, rice fields and the adjacent uplands (Service 2003). The snake feeds on small fishes, tadpoles, and frogs (Fitch 1941; Hansen and Brode 1980, Hansen 1988; Hansen and Brode 1993). Essential habitat components consist of: (1) wetlands with adequate water during the snake's active season (early-spring through mid-fall) to provide food and cover, (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat during the active season, (3) upland habitat with grassy banks and openings in waterside vegetation for basking, and (4) higher elevation uplands for over-wintering habitat with escape cover (vegetation, burrows) and underground refugia (crevices and small mammal burrows) (Hansen 1988). Snakes are typically absent from larger rivers and other bodies of water that support introduced populations of large, predatory fish, and from wetlands with sand, gravel, or rock substrates (Hansen and Brode 1980, Hansen 1988; Rossman and Stewart 1987). Riparian woodlands do not provide suitable habitat because of excessive shade, lack of basking sites, and absence of prey populations (Hansen 1988).

Foraging Ecology. Giant garter snakes are the most aquatic garter snake species and are active foragers, feeding primarily on aquatic prey such as fish and amphibians (Fitch 1941). Historically, giant garter snake prey likely consisted of Sacramento blackfish (*Orthodon microlepidots*), thick-tailed chub (*Gila crassicauda*), and red-legged frog (*Rana aurora*) (Rossman et al. 1996; Service 2003). Because these prey species are no longer available (chub extinct, red-legged frog extirpated from the Central Valley, blackfish declining) the predominant food items are now introduced species such as carp (*Cyprinus carpio*), mosquito-fish (*Gambusia affinis*), larval and sub-adult bullfrogs (*Rana catesbiana*), and Pacific chorus frogs (*Pseudacris regilla*) (Fitch 1941, Hansen and Brode 1993; Rossman et al. 1996).

Reproductive Ecology. The giant garter snake breeding season extends through March and April, and females give birth to live young from late July through early September (Hansen and Hansen 1990). Brood size is variable, ranging from 10 to 46 individual young, with a mean of 23 individuals (Hansen and Hansen 1990). At birth, young average about 8.1 inches (20.6

centimeters) snout-to-vent length and 3-5 grams. Although growth rates are variable, young typically more than double in size by one year of age, and sexual maturity averages three years in males and five years for females (Service 1993).

Movements and Habitat Use. The giant garter snake is highly aquatic but also occupies a terrestrial niche (Service 2003). Aquatic habitat includes remnant native marshes and sloughs, restored wetlands, low gradient streams, and agricultural wetlands including rice fields and irrigation and drainage canals. Terrestrial habitat includes adjacent uplands which provide areas for basking, retreats and over-wintering. Basking takes place in tules, cattails, saltbush, and shrubs over-hanging the water, patches of floating vegetation including waterweed, on rice checks, and on grassy banks (Service 2003). The snake typically inhabits small mammal burrows and other soil and/or rock crevices during the colder months of winter (*i.e.*, October to April) (Hansen and Brode 1993; Wylie et al. 1996). It also uses burrows as refuge from extreme heat during its active period (Wylie et al. 1997). While individuals usually remain in close proximity to wetland habitats, the Biological Resource Division of the U.S. Geological Survey (BRD) has documented snakes using burrows as much as 165 feet (50 meters) away from the marsh edge to escape extreme heat, and as far as 820 feet (250 meters) from the edge of marsh habitat for over-wintering habitat (Wylie et al. 1997; Wylie et al. 2003a). Snakes typically select burrows with sunny exposures along south and west facing slopes (Service 1993).

In studies of marked snakes in the Natomas Basin, snakes moved about 0.25 to 0.5 miles (0.4 to 0.8 kilometers) per day (Hansen and Brode 1993). Home range (area of daily activity) averages about 0.1 miles^2 (25 hectares) in both the Natomas Basin and Colusa NWR (Wylie 1998; Wylie et al. 2002). Total activity varies widely between individuals; however, individual snakes have been documented moving up to 5 miles (8 kilometers) over a few days in response to dewatering of habitat, and snake home range has been shown to be as large as 14.5 square miles (3744 hectares) (Wylie et al. 1997; Wylie and Martin 2004).

In agricultural areas, snakes were documented using rice fields in 19-20 percent of the observations, marsh habitat in 20-23 percent of observations, and canal and agricultural waterway habitats in 50-56 percent of the observations (Wylie 1999). In the Natomas Basin, habitat used consisted almost entirely of irrigation ditches and established rice fields (Wylie 1998). In the Colusa NWR, snakes were regularly found on or near edges of wetlands and ditches with vegetative cover (Wylie et al. 2003a). Telemetry studies also indicate that active snakes use uplands extensively; more than 31 percent of observations were in uplands (Wylie 1999). Snakes observed in uplands during the active season were consistently near vegetative cover, particularly where cover exceeded 50 percent in the area within 1.6 ft (0.5 m) of the snake (Wylie 1999).

Snakes will move into restored habitat after two years. At the Colusa NWR, after two years, restoration area population estimates increased from 30 snakes per kilometer to 59-95 snakes per kilometer (Wylie et al. 2003a). At the Colusa Basin Drainage Canal, snakes were given three upland restoration treatments, 1) soil planted with native grasses over rock riprap, 2) soil planted with native grasses without rock, and 3) rock riprap only; snakes were most commonly found at the soil over rock riprap treatment (Wylie and Martin 2004).

Predators. Giant garter snakes are eaten by a variety of predators, including raccoons (*Procyon lotor*), striped skunks (*Mephitis mephitis*), opossums (*Didelphis virginiansa*), bull frogs (*Rana catesbiana*), hawks (*Buteo* sp.), egrets (*Casmerodius albus, Egretta thula*), and great blue herons (*Ardea herodias*) (Service 2003; Dickert 2003; Wylie et al. 2003b). Many areas supporting snakes have been documented to have abundant predators; however, predation does not seem to be a limiting factor in areas that provide abundant cover, high concentrations of prey items, and connectivity to a permanent water source (Hansen and Brode 1993; Wylie et al. 1996).

Reasons for Decline and Threats to Survival. The current distribution and abundance of the giant garter snake is much reduced from former times (Service 2003). Less than 10 percent of the historic 4.5 million acres (1.8 million hectares) of Central Valley wetlands remain, only approximately 319,000 acres (129,000 hectares) (U.S. Department of Interior 1994), of which very little currently provides habitat suitable for the giant garter snake. Loss of habitat due to agricultural activities and flood control have extirpated the snake from the southern one-third of its range in former wetlands associated with the historic Buena Vista, Tulare, and Kern lakebeds (Hansen and Brode 1980; Hansen 1980). These lakebeds once supported vast expanses of ideal snake habitat, consisting of cattail and bulrush dominated marshes (Service 2003). Cattail and bulrush floodplain habitat also historically typified much of the Sacramento Valley (Hinds 1952). Prior to reclamation activities beginning in the mid- to late-1800s, about 60 percent of the Sacramento Valley was subject to seasonal overflow flooding providing expansive areas of snake habitat (Hinds 1952). Valley flood wetlands are now subject to cumulative effects of upstream watershed modifications, water storage and diversion projects, as well as urban and agricultural development.

The Central Valley Project (CVP), planned by the State of California, and built and operated by the Federal Bureau of Reclamation, is the largest water management system in California. CVP and the historic water development activities that preceded it have not only resulted in the loss of all but approximately 10 percent of wetlands, they have created an ecosystem altered to such an extent that remaining wetlands, like agriculture, depend on managed water (U.S. Department of Interior 1994). The historic disturbance events associated with seasonal inundation that occur naturally in dynamic riverine, riparian, and wetland ecosystems have been largely eliminated. In addition to the highly managed water regimes, implementation of CVP has resulted in conversion of native habitats to agriculture, and has facilitated urban development through the Central Valley (Service 2003). In 1992, Congress enacted the Central Valley Project Improvement Act (CVPIA), the principal concerns of which include pricing and management of Central Valley water and attempting to mitigate for the fish, wildlife, and associated habitat impacts of the project. CVPIA, however, has been largely ineffective, addressing primarily only the water needs of publicly-owned wetlands, which account for less than one-fourth of the wetlands in the Central Valley (Service 2003).

Ongoing maintenance of aquatic habitats for flood control and agricultural purposes eliminates or prevents the establishment of habitat characteristics required by snakes (Hansen 1988). Such practices can fragment and isolate available habitat, prevent dispersal of snakes among habitat units, and adversely affect the availability of the snake's food items (Hansen 1988; Brode and

Hansen 1992). For example, tilling, grading, harvesting and mowing may kill or injure giant garter snakes (Service 2003). Biocides applied to control aquatic vegetation reduce cover for the snake and may harm prey species (Wylie et al. 1996). Rodent control threatens the snake's upland estivation habitat (Wylie et al. 1996). Restriction of suitable habitat to water canals bordered by roadways and levee tops renders snakes vulnerable to vehicular mortality (Wylie et al. 1997). Materials used in construction projects (e.g., erosion control netting) can entangle and kill snakes (Stuart et al. 2001). Livestock grazing along the edges of water sources degrades water quality and can contribute to the elimination and reduction of available quality snake habitat (Hansen 1988). Fluctuation in rice and agricultural production affects stability and availability of habitat (Wylie and Casazza 2001).

Other land use practices also currently threaten the survival of the snake. Recreational activities, such as fishing, may disturb snakes and disrupt basking and foraging activities. Nonnative predators, including introduced predatory game fish, bullfrogs, and domestic cats, can threaten snake populations (Wylie et al. 1996; Dickert 2003; Wylie et al. 2003b). While large areas of seemingly suitable snake habitat exist in the form of duck clubs and waterfowl management areas, water management of these areas typically does not provide the summer water needed by the species. Degraded water quality continues to be a threat to the species both on and off refuges.

The Central Valley is among the most endangered ecosystems due to its fertile soils, amiable climates, easy terrains, and other factors that historically have encouraged human settlement and exploitation (Noss et al. 2003). Environmental impacts associated with urbanization include loss of biodiversity and habitat, alternation of natural fire regimes, fragmentation of habitat from road construction, and degradation due to pollutants (Service 2003). Rapidly expanding cities within the snake's range include Chico, Yuba City, the Sacramento area, Galt, Stockton, Gustine, and Los Banos.

Status with Respect to Recovery. The revised draft recovery plan for the giant garter snake subdivides its range into three proposed recovery units (Service 2003): (1) Northern Sacramento Valley Recovery Unit, (2) Southern Sacramento Valley Recovery Unit, and (3) San Joaquin Valley Recovery Unit.

The Northern Sacramento Valley Unit at the northern end of the species' range contains sub-populations in the Butte Basin, Colusa Basin, and Sutter Basin (Service 2003). Protected snake habitat is located on state refuges and refuges of the Sacramento National Wildlife Refuge (NWR) Complex in the Colusa and Sutter Basins. Suitable snake habitat is also found in low gradient streams and along waterways associated with rice farming. This northern most recovery unit is known to support relatively large, stable sub-populations of giant garter snakes (Wylie et al. 1996; Wylie et al. 2002). Habitat corridors connecting subpopulations, however, are either not present or not protected.

The Southern Sacramento Valley Unit includes sub-populations in the American Basin, Yolo Basin, and Delta Basin (Service 2003). The status of Southern Sacramento Valley sub-populations is very uncertain; each is very small, highly fragmented, isolated, and threatened by

urbanization (Service 2003; Hansen 2004). The American Basin sub-population, although also threatened by urban development, receives protection from the approved Metro Air Park and in-progress Natomas Basin habitat conservation plan (HCP), which share a regional strategy to maintain a viable snake sub-population in the basin.

The San Joaquin Valley Unit includes sub-populations in the San Joaquin Basin and Tulare Basin. The San Joaquin Valley Unit formerly supported large snake populations, but numbers have severely declined, and recent survey efforts indicate numbers are extremely low compared to Sacramento Valley sub-populations (Wylie 1998; Dickert 2002). Giant garter snakes currently occur in the northern and central San Joaquin Basin within the Grassland Wetlands, in North and South Grasslands, Mendota Area, and Burrel/Lanare Area. Agricultural and flood control activities are presumed to have extirpated the snake from the Tulare Basin (Hansen 1995); however, comprehensive surveys for this area are lacking and where habitat remains, the giant garter snake may be present (Service 2003).

Since 1995, BRD has been studying life history and habitat requirements of the giant garter snake within a few of the "13 populations" identified in the listing. BRD has studied snake sub-populations at the Sacramento, Delevan, and Colusa NWRs, in the Colusa Basin Drain within the Colusa Basin, at Gilsizer Slough within the Sutter Basin, at the Badger Creek area of the Cosumnes River Preserve within the Badger Creek/Willow Creek area, and in the Natomas Basin within the American Basin, (Wylie et al. 1996, 2002, 2003a, 2004; Wylie 1998, 1999, 2003; Hansen 2003, 2004), which represent the largest extant giant garter snake sub-populations. Outside of protected areas, however, snakes are still subject to all threats identified in the final rule. The other sub-populations are distributed discontinuously in small, isolated patches, and are vulnerable to extirpation by stochastic environmental, demographic, and genetic processes (Goodman 1987).

Until recently, there were no post-1980 sightings of giant garter snakes from Stockton southward, and surveys of historic localities conducted in 1986 did not detect any snakes (Hansen 1988). Since 1995, however, surveys conducted by CDFG in cooperation with BRD around Los Banos and Volta Wildlife Area in the Grasslands, and Mendota Wildlife Area in the Mendota Area have detected snakes, but in small numbers much lower than those found in Sacramento Valley sub-populations (Wylie 1998; Dickert 2002, 2003; Williams & Wunderlich 2003). The estimated total population size for Volta Wildlife Area is 45 individuals, approximately only 3.5 snakes per kilometer. Such low numbers are suggestive of a tenuously small snake population. Also, one-third of the giant garter snakes found had lumps on their bodies suggestive of a parasitic nematode infection (Dickert 2003); further study is underway. Ten of the 31 snakes found in 2003, however, weighed less than 40 grams indicating that giant garter snakes have been breeding at Volta Wildlife Area. These results demonstrate that giant garter snakes are still extant in the northern San Joaquin Valley, but probably in extremely low numbers/densities. All sub-populations are isolated from each other with no protected dispersal corridors. Opportunities for re-colonization of small sub-populations that may become extirpated are unlikely given the isolation from larger populations and lack of dispersal corridors between them.

The revised draft recovery criteria require multiple, stable sub-populations within each of the three recovery units, with sub-populations well-connected by corridors of suitable habitat. This entails that corridors of suitable habitat between existing snake sub-populations be maintained or created to enhance sub-population interchange to counter threats to the species (Service 2003). Currently, only the Northern Sacramento Valley Recovery Unit is known to support relatively large, stable giant garter snake sub-populations. Habitat corridors connecting sub-populations, even for the Northern Sacramento Valley Recovery Unit, are either not present or not protected. Overall, the future availability of habitat in the form of canals, ditches, and flooded fields are subject to market-driven crop choices, agricultural practices, and land use, and are, thus, uncertain and unpredictable.

Environmental Baseline

The proposed project is located within the American Basin snake population, in the Southern Sacramento Valley Recovery Unit (Service 2003). Fifty-nine CNDDB (2005) locality records are known from the American Basin. These locality records include the Natomas Basin, Bear River and associated tributaries, the Middle-American Basin just north of the Natomas Cross Canal, as well as other locations within the basin.

The distribution of the snake in Yuba County is not well known. A search of the California Natural Diversity Database (CNDDB 2005) indicates one locality record known from Yuba County, located 3.7 miles (6 km) to the south of the proposed project site, just south of Bear River and east of SR 70. The Service maintains an additional locality record of the snake in the Clark Lateral Diversion Canal directly west of its junction with SR 70 (Sycamore Environmental Consulting, Inc 1998), located approximately 4 miles (6.4 km) north of the proposed project site. While CNDDB indicates that snakes are widely distributed throughout the southern part of the American Basin, which includes the Natomas Basin, suggesting that a large snake population inhabits this rice production district, few records exist for the northern part of the American Basin (CNDDB 2005). This paucity of records, however, may reflect a lack of survey efforts rather than absence of the species. Intensive survey efforts will be required before it can be concluded snakes are absent from the northern portion of the American Basin.

Factors Affecting the Snake within the Action Area - The American Basin represents one of the largest and better protected giant garter snake sub-populations. Nonetheless, this sub-population is subject to the affects of a number of projects. Numerous development projects have been constructed in or near snake habitat in this rapidly urbanizing area. Any remaining sub-populations are vulnerable to secondary effects of urbanization, such as increased predation by house cats, water pollution, and increased vehicular mortality. Most documented localities have been adversely impacted by development, including freeway construction, flood control projects, and commercial development. Several former localities are known to have been lost and/or depleted to the extent that continued viability is in question (Brode and Hansen 1992). The scarcity of remaining suitable habitat, flooding, stochastic processes, and continued threats of habitat loss pose a severe threat to this sub-population (Goodman 1987).

A number of State, local, private, and unrelated Federal actions have occurred within the action area and adjacent region affecting the environmental baseline of the species. Some of these projects have been subject to prior section 7 consultation. These actions have resulted in both direct and indirect effects to snake habitat within the region. Projects affecting the environment in the action area include flood control projects and road projects. In the past 10 years, the Service has authorized approximately 335 acres of take in the American Basin.

Ongoing agricultural and flood control activities may decrease and degrade the remaining habitat throughout the snake's extant range affecting the environmental baseline for the snake. Such activities are largely not subject to section 7 consultation. Some agriculture, such as rice farming, can provide valuable seasonal foraging and upland habitat for the snake. Although rice fields and agricultural waterways can provide habitat for the snake, agricultural activities such as waterway maintenance, weed abatement, rodent control, and discharge of contaminants into wetlands and waterways can degrade snake habitat and increase the risk of snake mortality (Service 2003). On-going maintenance of agricultural waterways can also eliminate or prevent establishment of snake habitat, eliminate food resources for the snake, and fragment existing habitat and prevent dispersal of snakes (Service 2003).

Flood control and maintenance activities which can result in snake mortality and degradation of habitat include levee construction, stream channelization, and rip-rapping of streams and canals (Service 2003). Flood control programs are administered by the Corps, and the Corps typically has consulted on previous projects and is expected to continue to do so on future projects. The ongoing nature of these activities and the administration under various programs, however, makes it difficult to determine the continuing and accumulative effects of these activities.

In addition to projects already discussed, projects affecting the environment in the action area include transportation projects with Federal, county, or local involvement. The FHWA and/or the Corps have consulted with the Service on the issuance of wetland fill permits for several transportation-related projects within the American Basin that affected snake habitats. The direct effect of these projects is often small and localized, but the effects of transportation projects, which improve access and therefore indirectly affect snakes by facilitating further development of habitat in the area and by increasing snake mortality via vehicles, are not quantifiable.

On-going development within the Natomas Basin also affects the snake and its habitat. In February of 2002, the Service issued an incidental take permit (ITP) to the Metro Air Park Property Owners Association (MAPPOA) for development activities associated with the implementation of the MAPHCP. On June 27, 2003, the Service issued ITPs to the City of Sacramento, Sutter County, and TNBC for activities associated with the implementation of the Final NBHCP (City of Sacramento et al. 2003). TNBC is the plan operator responsible for acquiring and managing habitat mitigation lands for the MAPHCP and NBHCP. The MAPHCP and NBHCP permits authorized the development of 17,500 acres of land in the Natomas Basin; of this, approximately 8,512 acres is suitable snake habitat (*e.g.*, ponds, canals, and rice fields) (Service 2003). A key component of the MAPHCP and NBHCP's conservation strategy is the acquisition of 0.5 acre of habitat mitigation lands for every acre of land developed. A total of

75 percent of the mitigation lands will be suitable for the snake, with 50 percent in rice fields and 25 percent in managed marsh. Once the MAPHCP and NBHCP have been built out, approximately 6,562 acres of habitat will have been acquired for the snake, including 4,375 acres of rice fields and 2,187.5 acres of managed marsh. As of January 21, 2004, TNBC had acquired 3,415 acres of lands to mitigate the impacts of these HCPs.

Construction activities associated with the proposed project are likely to adversely affect the snake. While no reported occurrences of snakes are known for the proposed project site, CNDDB (2005) records indicate that the snake occurs in vicinity of the proposed project area, with two records within 5 miles (8 km) of the site itself. The snake has been document to move 5 miles (8 km) over the course of a few days (Wylie *et al.* 1997). Therefore, due to proximity of snake observation records and the occurrence of highly suitable habitat in nearby areas, the biology and ecology of this species, as well as the presence of suitable habitat in and adjacent to the proposed project site, the Service believes that the snake is reasonably certain to occur within the action area and, therefore, the proposed project is likely to adversely affect the species through permanent and temporary loss of habitat.

EFFECTS OF THE PROPOSED ACTION

Direct and Indirect Effects

Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp

Direct Effects

Individual listed crustaceans and their cysts may be directly injured or killed by activities that damage the pools in which they exist. The proposed project would (1) directly eliminate 2.71 acres of vernal pool habitat for listed vernal pool crustaceans; (2) result in the death of an unknown number of fairy shrimp and tadpole shrimp and/or their cysts; (3) indirectly affect approximately 6.43 acres of habitat for the listed vernal pool crustaceans; and (4) increase construction-related and recreational disturbance to the vernal pool tadpole shrimp and vernal pool fairy shrimp. Therefore, including direct and indirect effects, the Service estimates that 9.14 acres of seasonally inundated habitat will become unsuitable for these species as a result of the proposed action.

The Service considers that an entire vernal pool is directly affected if any part of the vernal pool is destroyed. Filling of a portion of a pool will decrease the size of the pool resulting in a change in the period of inundation and in the capacity of the pool to buffer potential changes in water temperature caused by solar radiation. A change of a few degrees in water temperature could kill the population of vernal pool fairy shrimp (Brent Helm, in litt. 2000).

Indirect Effects

Habitat indirectly affected includes all habitat supported by future destroyed upland areas and swales, and all habitat otherwise damaged by loss of watershed, human intrusion, introduced species, and pollution that will be caused by the project. The levee improvements along the WPIC will result in the indirect effects of approximately 6.43 acres vernal pool habitat. Individuals and their cysts may be injured or killed by any of the following several indirect effects:

Roads: The Service considers all vernal pools not considered to be directly affected, but within 250 feet of the proposed roadway shoulder widening and culvert work to be indirectly affected by project implementation. While applying asphalt surfacing to the roads, overspray and runoff may drain into the vernal pool habitat. Grading for roads may affect the water regime of vernal pool habitat, particularly when grading involves cutting into the substrata in or near habitat areas. Exposure of sub-surface layers of soil at road cuts may hasten the loss of water from adjacent habitat by mass flow through networks of cracks, lenses of coarser material, animal burrows, old root channels, or other macroscopic channels. Any decrease in the duration of inundation of habitat can affect the reproductive success of species present, including the listed vernal pool crustaceans. Erosion associated with road building can contaminate vernal pool habitat through the transport and deposition of sediments into these areas. Roads in or near the watersheds of habitat areas can lead to additional impacts through the introduction of chemically laden runoff (i.e., petroleum products) from the road surfaces.

Erosion: The ground disturbing activities in the watershed of vernal pools associated with the highway construction are expected to result in siltation when pools fill during the wet season following construction. Siltation in pools supporting listed crustaceans may result in decreased cyst viability, decreased hatching success, and decreased survivorship among early life history stages, thereby reducing the number of mature adults in future wet seasons.

Changes in hydrology: In addition to the direct impacts associated with filling discussed above, development can have adverse impacts on the hydrology of remaining habitat (e.g., pools/swales) and surrounding areas. Projects involving storm water drains or the coverage of land surfaces with concrete, asphalt, or irrigated recreation parks, etc., can affect the amount and quality of water available to the perched water tables characteristic of vernal pool areas. Changes to the perched water table can lead to alterations in the rate, extent, and duration of inundation (water regime) of remaining habitat. The biota of vernal pools and swales can change when the hydrologic regime is altered (Bauder 1986, 1987, in 59 **FR** 48136). Survival of aquatic organisms like vernal pool fairy shrimp is directly linked to the water regime of their habitat (Zedler 1987). Therefore, construction near vernal pool areas will, at times, result in the decline of local sub-populations of vernal pool organisms, including fairy shrimp and tadpole shrimp.

Human-related intrusion: Development frequently results in human intrusion into surrounding areas. Human intrusion is a mechanism by which trash or hazardous waste can be introduced into remaining habitat areas (Bauder 1986, 1987). Disposal of waste materials can eliminate habitat, disrupt pool hydrology, or release substances into pools that are toxic or that adversely

affect water chemistry. Off-road vehicle use and other recreational activities associated with humans can lead to wheel ruts, soil compaction, increased siltation, destruction of native vegetation, and an alteration of pool hydrology.

Introduction of non-natives: There is an increased risk of introducing weedy, non-native plants into the vernal pools both during and after project construction due to the soil disturbance from clearing and grubbing operations, and general vegetation disturbance associated with the use of heavy equipment.

Pesticides/Herbicides: The urban runoff from chemical contamination can kill listed species by poisoning. Road maintenance activities may include the introduction of pesticides or herbicides into the environment. Many of these chemical compounds are thought to have adverse effects on all of the listed vernal pool crustaceans and/or their cysts. Individuals may be killed directly or suffer reduced fitness through physiological stress or a reduction in their food base due to the presence of these chemicals.

In addition to the adverse effects detailed above, the proposed levee improvement project will contribute to a local and range-wide trend of urbanization and habitat loss and degradation, the principal reasons that the vernal pool fairy shrimp and vernal pool tadpole shrimp have declined.

The Corps proposes to compensate for direct and indirect effects by purchasing vernal pool creation and preservation credits at a conservation bank, and minimize and/or avoid indirect effects through the use of BMPs and establishing ESAs where vernal pools and other wetland habitat will not be disturbed. These measures will be sufficient to offset the effects of impacts

Valley Elderberry Longhorn Beetle

Direct Effects

The proposed project will require the removal of 21 elderberry shrubs, none of the shrubs have exit holes. In total, the proposed project would adversely affect 105 elderberry shrub stems one inch or greater in diameter at ground level by the removal of these shrubs. Because the elderberry shrubs will be transplanted outside of the transplant window described in the 1999 Guidelines, additional stress occur to the shrub. Transplanting shrubs in August when temperatures typically reach 100 degrees, causes stress to the shrub and increased likelihood of mortality.

According to the 1999 Guidelines, the required compensation for the proposed project would be to transplant the twenty-one shrubs and plant additional cuttings and associated riparian plantings at a Service-approved conservation area or bank. The elderberry compensation plantings will be incorporated into an on-site mitigation area.

Table 1: Proposed minimization ratios based on location (riparian vs. non-riparian), stem diameter of affected elderberry plants at ground level, and presence or absence of exit holes.

Location	Stems (maximum diameter at ground level)	Exit Hole on Shrub (Yes or No)	Elderberry Seedling Ratio	Associated Native Plant Ratio	Number of Stems Observed	Required Elderberry Plantings	Required Associated Native Plant Plantings
Non-riparian	stems ≥1" & ≤3"	No	1:1	1:1	32	32	32
		Yes	2:1	2:1	0	0	0
Non-riparian	stems >3" & <5"	No	2:1	1:1	1	2	2
		Yes	4:1	2:1	0	0	0
Non-riparian	stems ≥5"	No	3:1	1:1	10	30	30
		Yes	6:1	2:1	0	0	0
Riparian	stems ≥1" & ≤3"	No	2:1	1:1	6	12	12
		Yes	4:1	2:1	0	0	0
Riparian	stems > 3" & <5"	No	3:1	1:1	3	9	9
		Yes	6:1	2:1	0	0	0
Riparian	stems ≥5"	No	4:1	1:1	5	20	20
		Yes	8:1	2:1	0	0	0
Total replacement plantings						105	105
Replacement plantings with 4.5 increase						473	473
Total Elderberry shrubs to be transplanted						21	
473/5 = 94.6= 95 valley elderberry longhorn units or 3.93 acres							

Indirect Effects

Temporal loss of habitat may occur. Although conservation measures for effects on the valley elderberry longhorn beetle would involve creation or restoration of habitat, it generally takes five or more years for elderberry plants to become large enough to support beetles, and it may take 25 years or longer for riparian habitats to reach their full value. Temporal loss of habitat will temporarily reduce the amount of habitat available to beetles and may cause fragmentation of habitat and isolation of subpopulations.

Giant Garter Snake

Direct Effects

Construction activities associated with the project may disturb, harass, injure, or kill snakes. Construction activities may remove vegetative cover and basking sites, fill or crush burrows or

crevices, and decrease prey base. The construction, earthen work activities, and earth surface modifications will permanently and temporarily disturb aquatic and upland habitats. Because snakes utilize small mammal burrows and soil crevices as retreat sites, snakes may be crushed, buried, or otherwise injured from construction activities. Snakes may be killed or injured by construction equipment or other vehicles accessing the construction site. Snakes may also be killed or injured by becoming entangled in netting used for erosion control (Stuart et. al. 2001). Disturbance from construction activities may also cause snakes to temporarily move into or across areas of unsuitable habitat where they may be prone to higher rates of mortality from vehicles and predation.

Filling the borrow ditch and widening the WPIC levee would permanently remove 24.98 acres of upland and 19.81 acres of aquatic habitat and temporarily disturb another 95.76 acres of uplands and 0.36 acre of aquatic habitat. The aquatic habitat provides water during the snake's active period, and the uplands provides habitat for basking, cover, and retreat sites, and higher elevation upland for cover and refuge from flood waters. After completion of construction the area along the WPIC would be restored to preexisting condition. Additionally, no later than 30 days past the initiation of construction, 134.37 credits would be purchased by the project proponent at a Service approved mitigation bank.

Indirect Effects

Possible indirect effects of the proposed project on the giant garter snake include: human intrusion, predation, dumping of garbage causing contamination or injury, and aiding the success of exotic species such as predatory game fish which may prey on juveniles or compete with snakes for prey. Other potential habitat alterations include changes in fluvial morphology and floodplain configurations for flood control, resulting in lack of refugia, loss of aquatic corridors, and restriction of movement. Disturbed soils that are not replanted quickly may provide optimum soil conditions for colonization of noxious weeds such as yellow star-thistle (*Centaurea solstitialis*). Yellow star-thistle can form a dense impenetrable barrier that may preclude snakes from moving through. Restoration and revegetation of the temporarily disturbed area with locally collected native plants would minimize the adverse effects resulting from the temporal loss of vegetative cover.

Interrelated and Interdependent Actions

Additional effects from interrelated and interdependent actions are expected from the proposed project. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no significant independent utility apart from the proposed action.

The proposed project would provide increased flood protection for RD 784. It would address deficiencies in the lower Bear River levee that have led to uncertainty and controversy surrounding the planned and ongoing development in the RD 784 area, specifically the Plumas Lake development, East Linda development and North Arboga study area. Because the California State Reclamation Board (Board) viewed the development in this area as imminently

dangerous to public health, safety and welfare due to flooding risks, the Board required Yuba County to reduce the rate of development in this area for the purpose of minimizing the increase of the imminent threat to public health, safety, and welfare while allowing progress toward substantial reduction or elimination of such imminent threat. Therefore, Yuba County has restricted the number of new residential building permits to 800 for calendar year 2005 and 700 for calendar year 2006.

Continuing development in Yuba County and the expansion of planned growth that is facilitated by the implementation of the proposed project will require the extension of utilities and the enlargement of roads in areas adjacent to and surrounding the proposed projects action area. Future projects which will support the planned development may adversely affect several federally-listed species including but not limited to vernal pool crustaceans, valley elderberry longhorn beetle, and giant garter snake.

The Feather River, Bear River, and Western Pacific Interceptor Canal Levee Improvements Project is interrelated to other flood control project which have occurred or being planned in the area including the Yuba River Basin Investigation project, Yuba River South Levee Improvements project, Sutter County Feasibility Study, Sacramento River Flood Control System Evaluation Phase II project, and Sacramento Area Flood Control Agency Regional Project. Those projects which have already occurred have affected giant garter snakes and valley elderberry longhorn beetles.

Currently, a Yuba-Sutter Habitat Conservation Plan (YSHCP) is being developed. So therefore, while planned development activities in Yuba County may negatively affect listed species and their habitats, the YCHCP will eventually ensure that development activities would avoid, minimize, and compensate for take of listed species to the greatest extent possible. The YSHCP would address the indirect affects of facilitated planned development that results from the interrelated and interdependent actions that result from the proposed project. At a minimum, the YSHCP will address the Federal and State listed species known at this time that may be affected by actions that are reasonably foreseeable as a result of the proposed action. Additional HCP-covered species may be added as the HCP is being developed. The YSHCP will address actions that are within the land use authority of Yuba and Sutter Counties and are reasonably foreseeable as a result of the proposed action, including land use approvals that are related to entitlements. Additional activities may be added as the YSHCP is developed. The YSHCP will cover a cumulative effects boundary area that is reasonably foreseeable as a result of this project and future levee improvement projects.

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed project are not considered in this section, because they require separate consultation pursuant to section 7 of the Act. An undetermined number of future land use conversions and routine agricultural practices are not subject to Federal authorization or funding and may alter the habitat or increase incidental take of listed